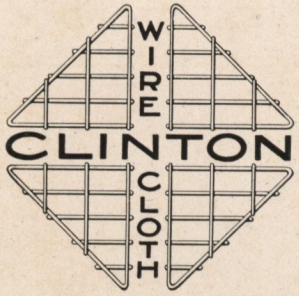
CLINTON HANDBOOK ON LATH AND PLASTER

CLINTON WIRE CLOTH COMPANY
CLINTON, MASS.


WIRE
CLINTON
CLOTH

HANDBOOK

Containing

Descriptions, Drawings, Tables, Methods and Specifications Relating to

Furring, Lathing and Plastering

And Dealing Especially with the Uses of

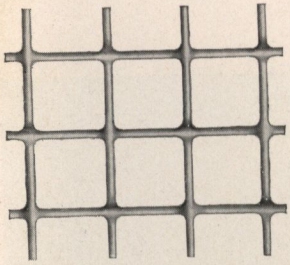
CLINTON WIRE LATH

A REFERENCE BOOK FOR
ARCHITECTS, BUILDERS
AND PLASTERERS

CLINTON WIRE CLOTH COMPANY
CLINTON, MASSACHUSETTS
Boston New York Chicago San Francisco
AGENCIES THROUGHOUT THE UNITED STATES AND CANADA

The Barta Press
Boston — New York

Introductory



THE object of fireproof construction, of course, is to produce a structure which will resist fire from without and also possess interior construction of such a character that a fire caused by inflammable contents may be confined to a certain part of the building, or even to a single room, and thereby be easily checked and extinguished.

In picturing such a structure in the mind's eye, one is very apt to think of a building possessing massive brick or concrete with bare walls, cumbersome fire doors and unattractive metal trim ; in other words, a structure wherein the esthetic questions of architectural beauty have given way entirely to questions of purely structural and practical value. Such, however, is not the case, for modern fireproof construction has developed and progressed architecturally as well as structurally so to-day it is possible to give a fireproof structure any desired degree of architectural embellishment.

In this connection it may be said that metal furring and wire lath used in the construction of partitions, ceilings, cornices and even exterior stucco work are ideal in their adaptability to highly ornamental shapes and designs and have actually made possible the execution of architectural effects which would have been practically impossible with the old-time cumbersome construction involving wood lath and furring.

In this development of fireproof construction, Clinton Wire Lath has been extensively used for many years and to-day great quantities of the material are being used to splendid advantage in all kinds of fireproof construction. The object of this book, therefore, is to show a few of the many ways in which the material may be successfully used and also to present a number of specifications and recommendations illustrating the best practice of the day in modern fireproof construction.

Other publications illustrating the many uses of our famous Electrically Welded Wire Reinforcement for concrete may be obtained upon request. This material is adapted to use in floors, roofs, walls, pavements, sewers, reservoirs, levees, and all kinds of construction wherein a mesh reinforcement is of particular advantage.

Auditorium in Municipal Building, Springfield, Mass.

Pell & Corbett, Architects, New York City

Ornamental plastering on Clinton Wire Lath, and concrete floors and balconies reinforced throughout with Clinton Electrically Welded Wire Reinforcement

Clinton Wire Lath

Clinton Quality

Clinton Wire Lath is a superior product and must not be classed among the many cheap and make-shift metal laths with which the market is now flooded. It has been the recognized standard of quality for over half a century and is the most efficient and trustworthy lathing material in use at the present time.

The Clinton Wire Cloth Company, the originator of wire cloth weaving, was the first concern to engage in the manufacture of fireproof lath. Soon after the invention of power looms for the weaving of woolens and cotton, the Clinton Wire Cloth Company perfected a form of loom for weaving wire and entered into the manufacture of their wire lath. This woven wire mesh was the first efficient form of metal fireproofing ever used. It was used for fireproofing purposes as early as 1856, and many buildings are now standing which were fireproofed with this material at that time.

Clinton Wire Lath is not the cheapest lath on the market, but it is the best and, everything considered, is by far the most economical. The methods of manufacture and the materials which enter into Clinton Lath have always been of the very best. Even in the face of keenest competition, no item which would add to quality has ever been sacrificed in the making of the Clinton product. The reputation of Clinton Wire Lath has been established by years of honest, reliable and careful methods of manufacture, which assure the purchaser that every roll of Clinton Lath will possess this unvarying Clinton quality and will be honestly and correctly tagged as to gage, mesh and quantity.

Years of Successful Use

Boston Theatre a Test of Sixty Years. Among the many notable instances in which Clinton Wire Lath has shown its real efficiency may be mentioned the case of the Boston Theatre, which was built about 1856 and in which Clinton Wire Lath was used. Some of the lath placed in this building at the time it was first

built has at times been removed in making certain alterations and when thus taken out has been found to be in perfect condition. The lath in this building has given such perfect satisfaction that in all these years there have been no indications whatever of cracking or loosening of the plaster.

Springfield National Bank, Springfield, Mass.
Thomas James, Architect

Fifth Avenue Hotel a Test of Fifty Years. The durability of Clinton Wire Lath was strikingly illustrated when the old Fifth Avenue Hotel, New York City, was torn down a few years ago. Clinton Lath which had been in that building for fifty years was found to be in just as good condition as when it was first made and revealed no indications of rust or deterioration of any character.

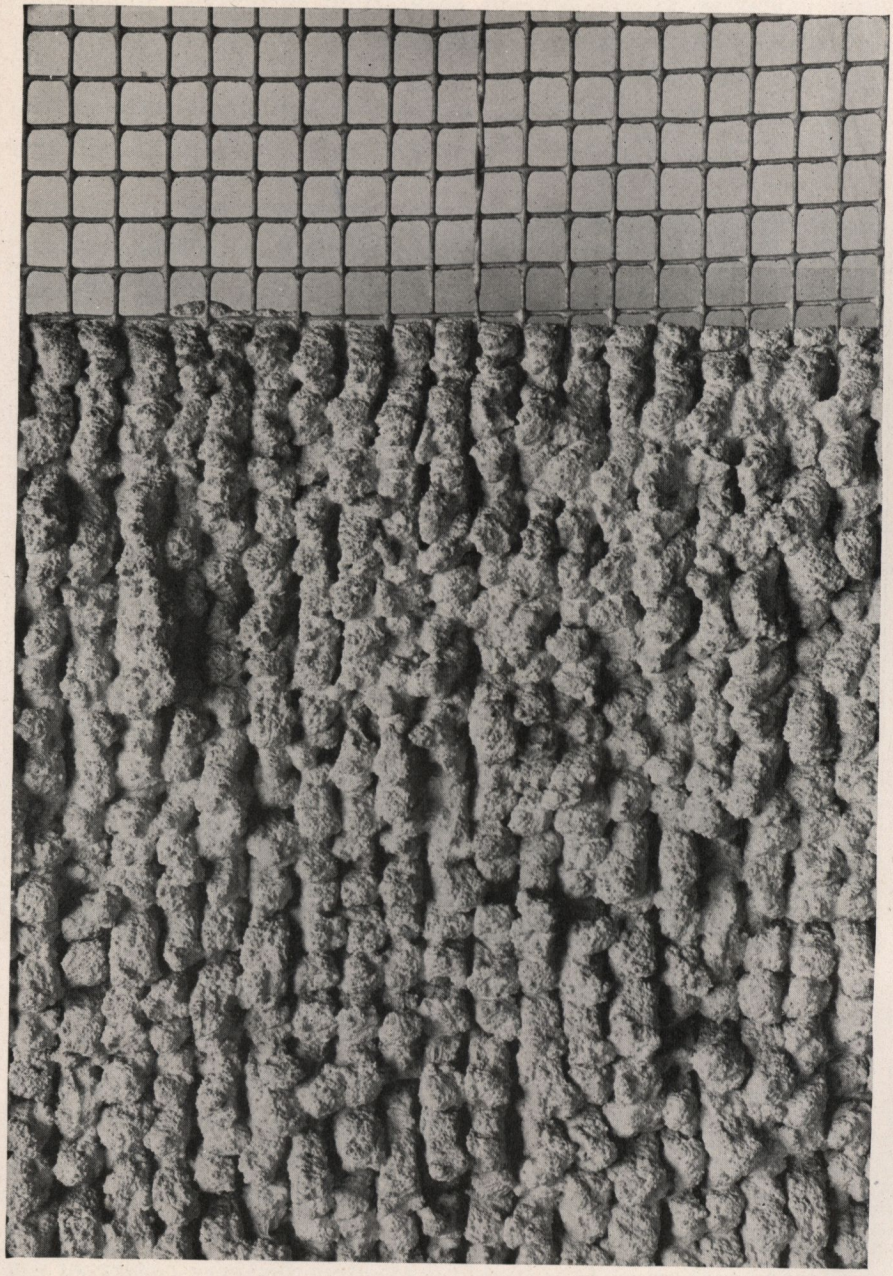
If space permitted we could thus cite many such cases of build-

ings in which Clinton Lath has stood from twenty to fifty years and is to-day as strong and doing its duty just as efficiently as when first placed in the work.

In the Great Chicago Fire. As early as the great Chicago Fire of 1871, Clinton Wire Lath was proved to be an efficient fireproof-

Women's Retiring Room — Chicago & Northwestern Railway Station, Chicago
Frost and Granger, Architects

ing material as demonstrated in the case of the Insurance Exchange Building. The floors of this building were supported by wooden joists which had no protection other than a covering of Clinton Wire Lath carrying 1½ inches of cement mortar. Even this crude and primitive attempt at fireproofing was sufficient to save the building. This building stood in the very center of the line of fire in that great conflagration and was so slightly injured that it was reoccupied in seven days after the fire.



Keyside of Plaster on Clinton Wire Lath

Note the perfect clinch of the mortar and the thorough manner in which the lath is embedded in the body of the plaster

Structural Advantages

Wire vs. Sheet Metal. A drawn steel wire when compared with a sheet metal is, in the matter of strength and general quality of material, a superior product. The wire, which is made by being drawn through a die, is, during its manufacture, subjected to a high tensile stress. This drawing and working of the material renders the wire a fibrous material of uniform quality and for this reason is stronger and more reliable than sheet metal, which is necessarily of an inferior grade and which suffers more or less injury through the process of cold cutting and expansion. A wire in order to withstand the high tensile stress produced as it is being drawn must, therefore, be a material, the strength and quality of which are actually tested and determined by its very process of manufacture. Clinton Wire Lath being a woven mesh made from the best quality of drawn steel wire possesses, therefore, a quality of material which cannot be obtained in any form of punched or expanded metal.

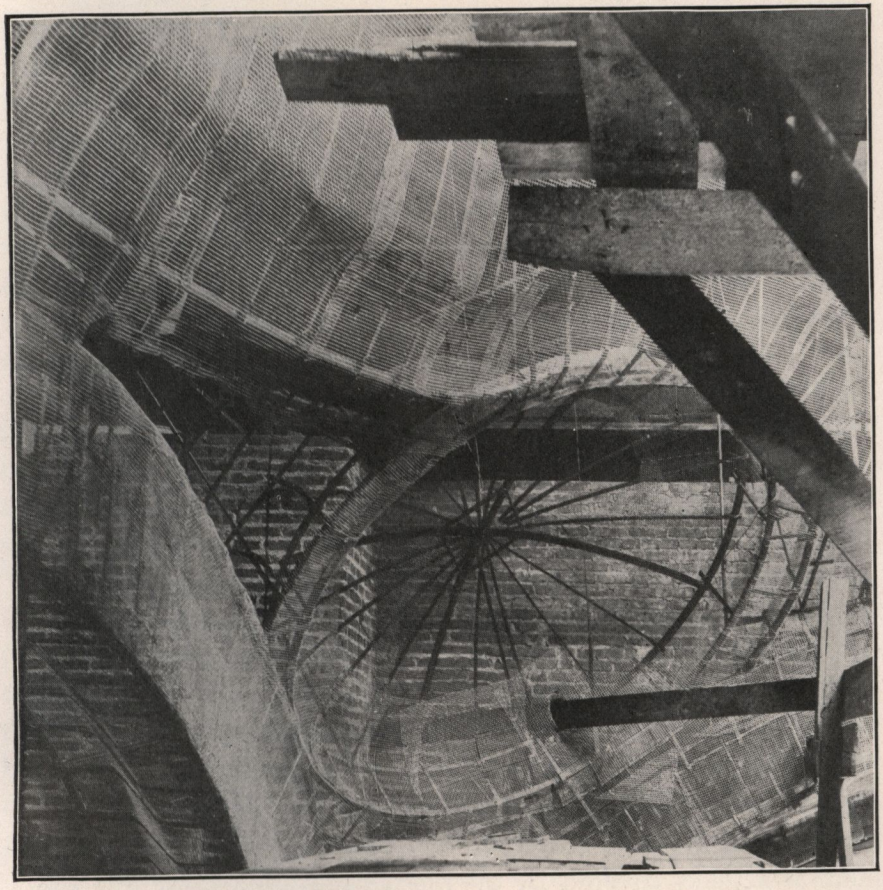
The Perfect Key. The primary function of any lathing material is to serve as a foundation to grip and hold mortar. It is the key or the clinch of the back plaster which actually determines the efficiency of the plastered surface. To obtain the best results it is not sufficient to have isolated portions of mortar here and there pushed through and turned on the reverse side of the lath, as is obtained with a great many types of metal lath. In order to insure substantial and *permanent* construction, it is absolutely essential that the lath be actually embedded in the body of the plaster. Without a thorough covering of back plaster, air and moisture will in time attack the metal and a slow but sure disintegration will result. In view of the ease with which mortar will pass over and around the small circular strands of a wire mesh with no flat or inclined surfaces to deflect or obstruct its passage, Clinton Lath enables plaster to form a more perfect key than can be obtained with any other type of lath. A glance at the key side of a wall plastered on Clinton Wire Lath will show the perfect manner in which the plaster surrounds the lath. The clinch of the back plaster is perfect; every wire is covered and it is impossible to

Suspended Wire Lath Ceiling — Municipal Building, Springfield, Mass.

Pell and Corbett, Architects

detect a single strand so perfectly is the mesh embedded in the plaster.

Quantity of Plaster. This perfect key does not by any means indicate that wire lath will waste plaster. All metal which enters



Ornamental Furring and Lathing — Maine Memorial Chapel, Annapolis, Md.
Ernest Flagg, Architect

into the structural elements of a building must be protected against rust and corrosion. In the case of a metal lath it is this back plaster, this key, this rear side covering which must be relied upon to offer the necessary protection to the lath. The claim made by some manufacturers that their lath saves mortar is in

itself an admission of the fact that a thorough and satisfactory key is not obtained. Naturally any type of lath which permits the plaster to pass through and be turned here and there at isolated spots on the reverse side of the lath will use less plaster than one which permits the plaster to thoroughly cover the metal.

It must be remembered that this rear side of the plastered surface is inaccessible ; it cannot be reached after the front side has been plastered, and it is consequently necessary to rely upon the plaster that works through and forms the key to offer the necessary protection to the metal on the rear side of the wall. Is it economy, therefore, to take any chances with this unseen and hidden part of the construction ? If good work is desired, plaster must be used and Clinton Wire Lath will require absolutely no more plaster than will be necessary on any other type of metal lath used in such a way as to insure good first-class and reliable construction.

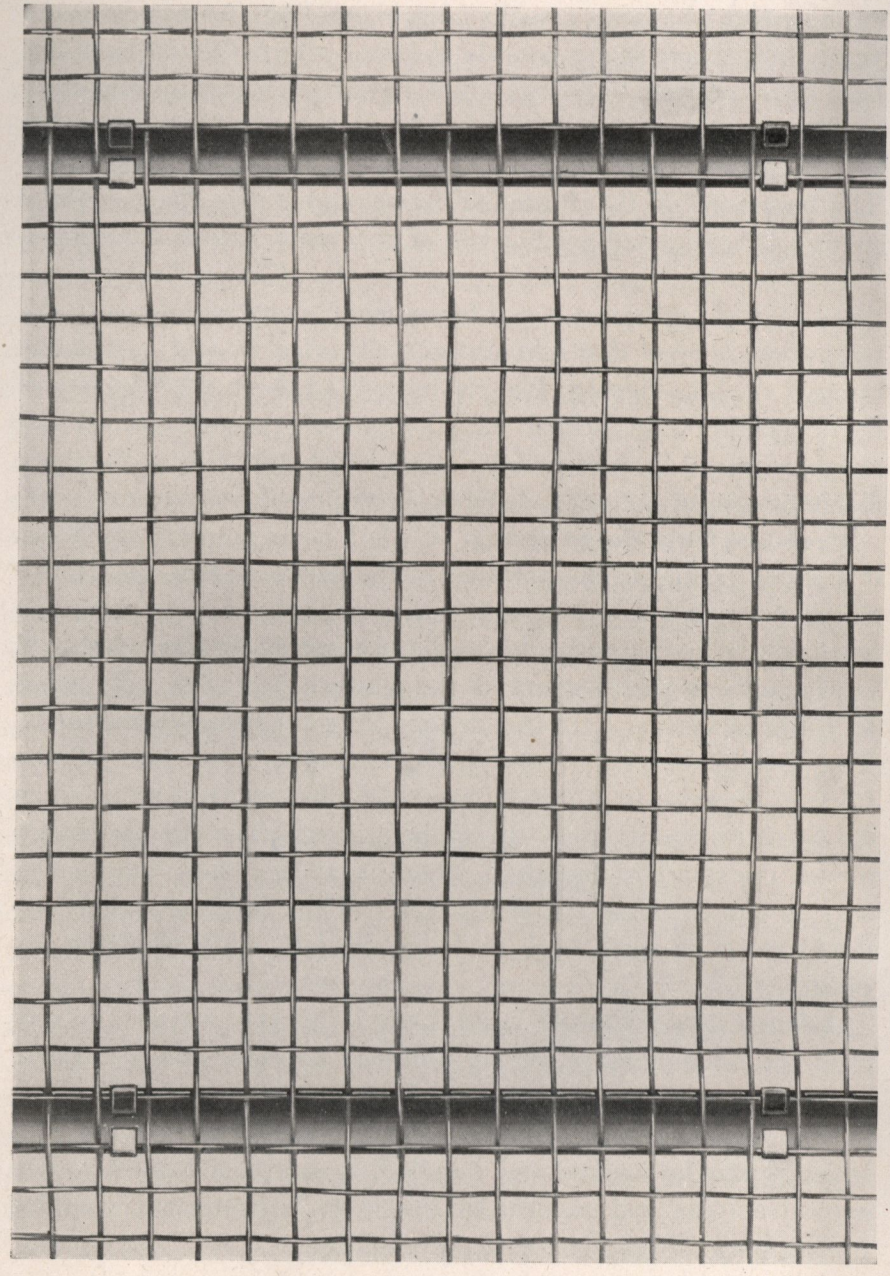
Reinforced Plaster. A wall composed of wire lath and mortar is in many respects similar to the familiar slab of reinforced concrete. It is not the mortar which makes the wall, nor is it alone the lath ; without the other either one would be useless. It is the mortar which, in setting and hardening, gives the proper stiffness and rigidity to the wall, while the lath supplies the necessary foundation for the application of the mortar and the essential metallic elements for binding and reinforcing the otherwise brittle plaster, thus preventing cracks and insuring stability. As in the reinforced concrete slab, so in the wall is it necessary that the metal provide an efficient reinforcement thoroughly embedded in and bonded with the body of the plaster. By the use of wire lath the metal is actually covered by the mortar and, because of the reinforcing action of the wire when so thoroughly bonded with the plaster, walls of this construction will exhibit remarkable strength and durability. Plaster on Clinton Wire Lath is thus practically reinforced, much as a concrete floor is reinforced, and for this reason is unusually strong and will not check or crack.

Durability. The claim that Clinton Wire Lath is durable and everlasting is by no means an unsubstantiated statement. It must be remembered that our lath has been in actual use for over half

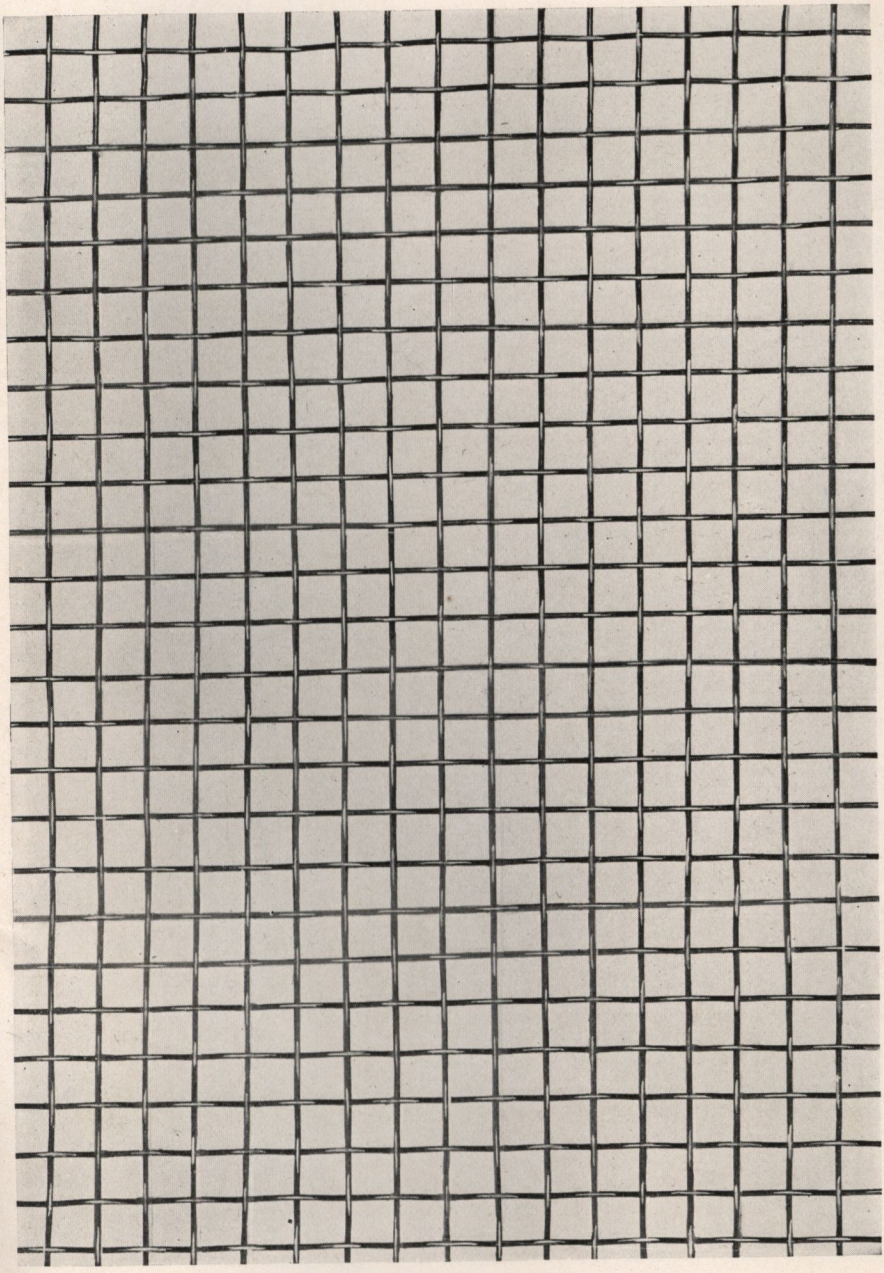
a century and in that time ample opportunity has been had to examine lath which has actually been in buildings for a great many years. We have many records of cases where Clinton Lath has been removed from buildings which have been standing from forty to fifty years and the material when taken out has invariably proved to be in just as good condition as the day it was made. The instances of the Boston Theatre and Fifth Avenue Hotel previously mentioned are but two of the many which have been called to our attention. The very fact that Clinton Lath has in these various structures stood for so many years without any deterioration is proof that it is always embedded in and completely covered on all sides by the plaster. Had there been in any of these buildings the least bit of lath exposed, the action of air and moisture would have eventually started rust and a slow but sure disintegration of the wire would have continued from year to year.

Freedom from Bulge or Sag. If a lath is not properly applied or if it yields readily to the pressure of the plasterer's trowel, it will bulge or sag and will invariably cause cracking of the plaster. In cases where furring strips are widely separated, ordinary lath will yield readily to the pressure of the plasterer's trowel. By using V-Stiffened Clinton Lath this danger may be entirely eliminated. The V-stiffeners in Clinton Lath, extending crosswise of the fabric at intervals of 8 inches, are rigid ribs, securely attached to the fabric by metal clips. In applying the plaster the plasterer's trowel, the standard length of which is 10½ inches, will always bear on one of these stiffening ribs. Thus it is impossible for the plasterer to push back or bulge the lath while applying the plaster.

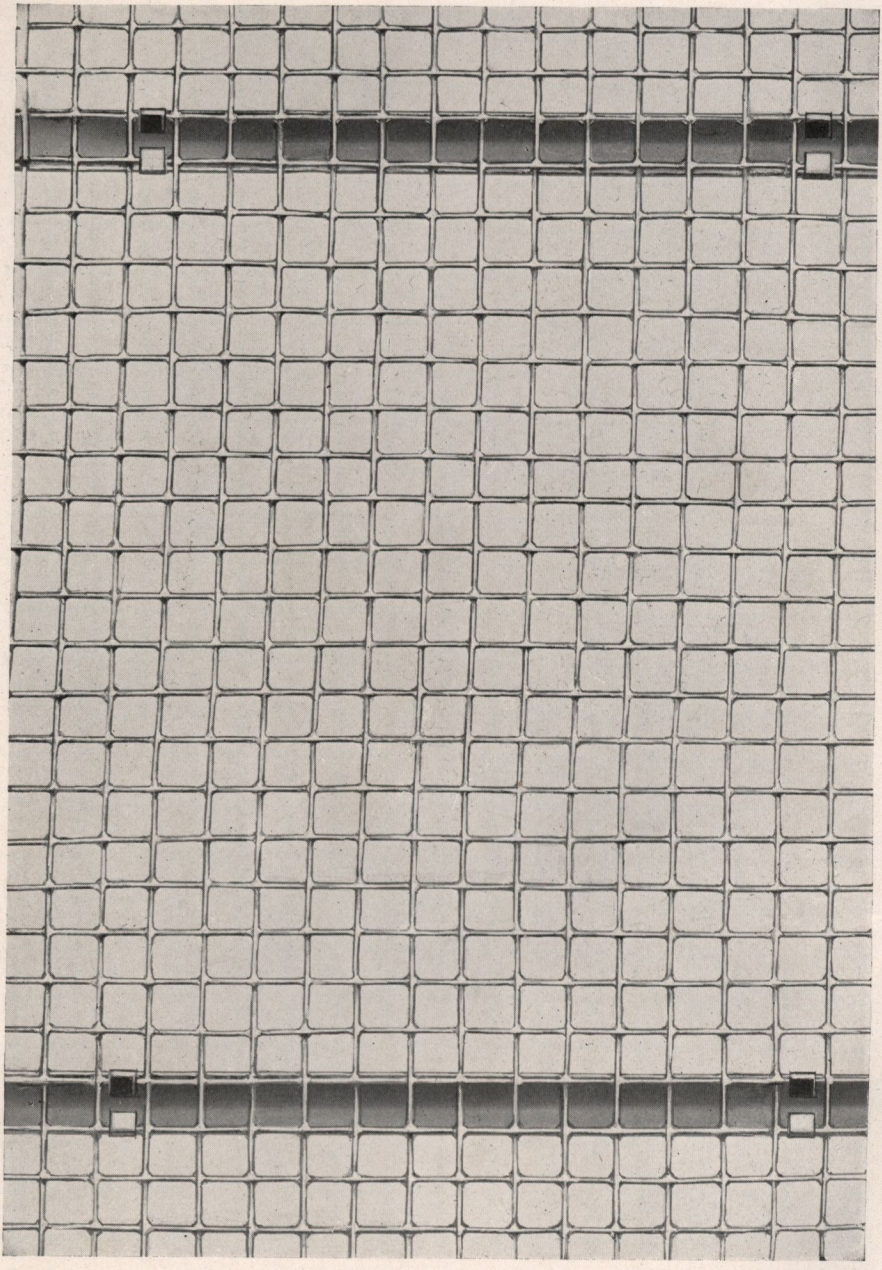
Adaptability. Clinton Wire Lath is adapted to all kinds of plain and ornamental plastering and may be easily and accurately installed at a minimum expense. It comes to the work in compact rolls, not in cumbersome sheets. Because of the ease with which it may be worked and handled, it can be laid quickly over extensive areas and secured to the most intricate and complex furring with the greatest ease and facility.



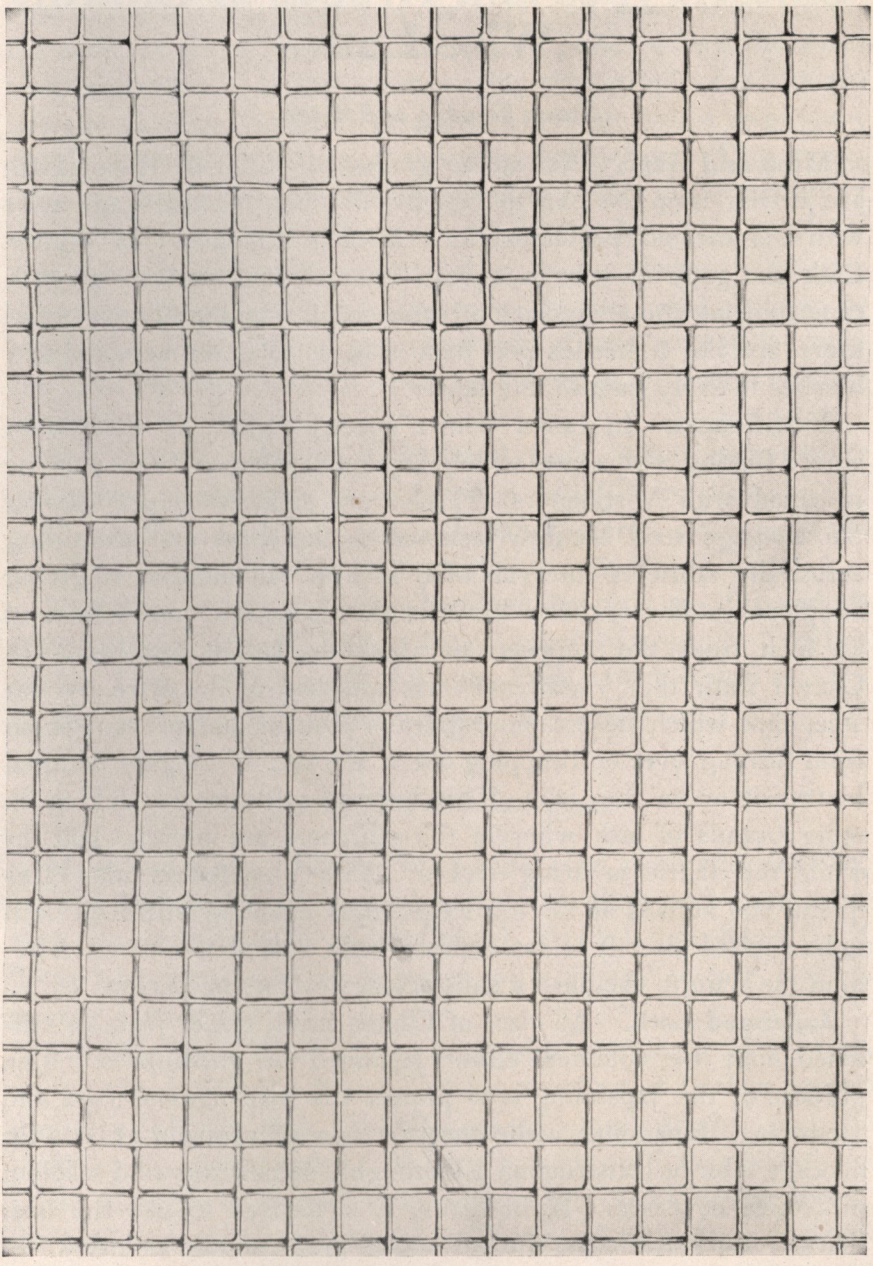
V-Stiffened Japanned Clinton Wire Lath



Plain Japanned Clinton Wire Lath



V-Stiffened Clinton Wire Lath, Galvanized-After-Woven



Plain Clinton Wire Lath, Galvanized-After-Woven

Sizes, Types and Grades of Clinton Wire Lath

Stock Grades and Sizes

Mesh and Gage. All stock grades of Clinton Wire Lath are woven from No. 18 to No. 21 Washburn-Moen gage wire with 2½ meshes per lineal inch in each direction. In Clinton Lath the gage of wire is always honestly and correctly tagged, thus showing the actual size of wire used. In the Clinton brand there are not 2 meshes per inch sold as 2½, but actually 2½ meshes to every inch of the fabric.

V-Stiffeners. In cases where special rigidity is desired or where furring strips are widely separated, Clinton Lath may be provided with V-stiffeners. These are rigid V-shaped ribs of No. 24-gage steel securely fastened to the wires and extending across the fabric at intervals of 8 inches. In addition to giving additional stiffness, these V-stiffeners also afford an off-set of ⅜ inch from the supports to which the lath is attached. In Clinton Lath the V-stiffeners are attached to the wire by flat steel clips which hold them rigidly in position and prevent them from turning over or dropping out if the lath is roughly handled in transit or on the job. This important feature is lacking in other brands of lath wherein the stiffeners are merely laid in while the fabric is being woven. The V-stiffeners may frequently be utilized as furring strips, thus enabling stiffened lath to be applied directly to flat surfaces with sufficient clearance behind the wire to establish a satisfactory key for the plaster.

Japanned Lath. All sizes of Clinton Lath, either plain or stiffened, may be obtained either japanned or galvanized. The purpose of the japanning is to protect the wire against rust and corrosion. Japanning while cheaper than galvanizing affords for average interior construction a thoroughly satisfactory and efficient protective covering. If, however, it is desired to use the best that the market affords, the galvanized grade should be used.

Galvanized-After-Woven Lath. Clinton Lath, either plain or stiffened, may be obtained in the grade known as " galvanized-

after-woven." This process of galvanizing after the mesh is formed increases the rigidity of the fabric as a result of the soldering action of the galvanizing fluid at the points where the wires cross each other. In the accompanying photograph of galvanized lath the particles of spelter at points where the wires cross show clearly how the wires are thus soldered together. This maintains the integrity of the mesh and adds greatly to the rigidity of the lath. The primary object of galvanizing, however, is to provide the wire with a protective coating as this forms, of course, the most efficient and lasting protection to the metal that can be obtained. This grade of material should always be used for exterior construction where the work is subjected to severe climatic conditions.

Size of Rolls. Clinton V-Stiffened Lath, either japanned or galvanized-after-woven, is furnished in rolls 100 feet long.

Clinton Plain Lath (*i.e.*, lath without stiffeners), either japanned or galvanized-after-woven, is furnished in rolls 200 feet long.

The stock width of Clinton Lath, either plain or stiffened, is actually 36⅝ inches. This width is called 36 inches and sold as such. Thus a 100-foot roll of Clinton Lath, which is sold as 33⅓ square yards, actually contains about 34 square yards.

Special Grades and Sizes

Mesh and Gage. Clinton Wire Lath may, upon special order, be obtained with various combinations of mesh and gage other than those mentioned under "Stock Grades and Sizes." A limited assortment of sizes woven with 2 meshes per inch is usually carried in stock.

V-Stiffeners. While the stock grades of Clinton Wire Lath are provided with V-stiffeners, giving an offset of ⅜ inch beyond the face of the lath, V-stiffeners of other depths may be obtained by special order. Where it is desired to use lath on brick, masonry or wooden walls without the use of furring strips, the lath may be provided with stiffeners of any desired depth which may be made to serve the purpose of furring strips. In many cases, however, the standard stiffener, which is ⅜ inch

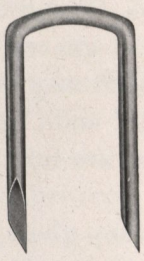
deep, will give sufficient clearance behind the lath to establish a perfectly satisfactory key for the plaster; but where greater depth than this is required or where it is desired to have an air space between the plaster and the wall, deeper stiffeners should be used. These special stiffeners are made of No. 24 gage steel and may be obtained with any desired depth.

Rod Stiffeners. Clinton Lath may also upon special order be provided with rod stiffeners if desired. These rods, which may be of any diameter or spacing, extend across the fabric and are securely bound to the lath by spiral wire clips which prevent their displacement under all conditions. Rod stiffeners usually consist of small rods of 5/16 inch or 1/4 inch diameter and are used principally to give the lath stiffness without attempting to provide any appreciable offset for furring purposes.

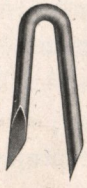
Size of Rolls. Clinton Wire Lath may, upon special order, be obtained in widths and lengths other than those mentioned under "Stock Grades and Sizes."

Clinton Staples

In applying V-Stiffened Wire Lath to wooden supports, it is advisable to secure the lath with staples which span the stiffener rather than with wire nails driven through the apex of the stiffener. For this purpose we recommend Clinton staples which are made of galvanized steel wire especially adapted for this use with points sharpened in a manner which facilitates driving them in hard wood.



1¼″ No. 13 Square Top



¾″ No. 14 Round Top

Our wide span staples are expressly made for applying our regular V-Stiffened Lath, our 1¼ inch, No. 13, square top staple being of sufficient spread and length to pass over the stiffeners and afford firm anchorage when driven into the supporting woodwork. For applying plain lath we suggest our ¾ inch, No. 14, round top staple.

How to Use and Specify Clinton Wire Lath

What to Use

Selection of the proper size of wire lath or any metal lath must necessarily be based upon a knowledge of certain sizes and grades which have been found from experience to give satisfactory results. Unlike the beams, girders, columns and other structural elements of a building the lath cannot be selected from any basis of mathematical computation and for that reason its selection involves necessarily the judgment and experience of the designer.

To meet various structural conditions and to provide considerable latitude for the designer in his selection of the lath, Clinton Wire Lath is manufactured with Nos. 18, 19, 20 and 21 Washburn-Moen gage wire and fabricated in two general types, — "plain" and "V-stiffened," — either of which may be obtained in three grades, — "uncoated," "japanned" and "galvanized-after-woven." These sizes, types and grades are fully described on page 20.

As to the proper type of lath to be used in any given case, that is, whether plain or stiffened, it may be said that this usually depends upon the spacing of the furring or the supports to which the lath is attached. The object of the V-stiffening ribs, with which all stock grades of Clinton V-Stiffened Lath are provided, is to give the lath additional stiffness or rigidity, which permits the lath to satisfactorily span a wider opening than could be spanned with the plain type. In general it may be said that plain lath can be used with perfect satisfaction when the furring members are spaced 12 inches, and in some cases even 16 inches, whereas the stiffened type should always be used when the supports are more than 16 inches apart. The stiffened type may also be selected at times, not from the standpoint of stiffness, but when it is desired to use a lath which will be self-furring and in this way make use of the V-stiffening ribs to offset or fur out the lath from the surface to which it is attached.

As to the proper size of wire to be used, we would in general

recommend, for ordinary average construction with 12-inch spacing of furring, the use of a No. 19 gage wire when the lath is plain, while a No. 18 gage may be used in special ceilings or cornices which are slightly heavier than usual, or in other cases where it is desired to increase the spacing of furring to 14 or 16 inches. If, however, the lath is provided with V-stiffeners, which are in reality small, secondary furring strips on 8-inch centers, a No. 20 gage wire is sufficient. In the case of the galvanized-after-woven grade slightly smaller sizes may be used with perfect satisfaction; as, for instance, a No. 20 gage when plain and a No. 21 gage when V-stiffened. This recommendation is made because of the additional rigidity of mesh obtained by the process of galvanizing after weaving, and also in view of the superior protection which this galvanizing offers to the wire.

As to the grade of lath to be used, it is not considered good practice to use uncoated lath except in cases where the durability of the lathing material is of little consequence or where cheap, unimportant work is being executed. It is seldom necessary, however, to consider the use of the plain black wire as the difference in cost between this grade, and the japanned grade is not enough to justify the use of the former in any work of importance. Japanning offers a very satisfactory protective covering to the metal in cases where it is not permanently exposed to severe corroding agents and may be recommended as perfectly satisfactory for all average interior construction. In exterior construction, especially in stucco work, and even in interior construction when it is desired to use the best the market affords, the galvanized-after-woven grade should always be used.

How to Apply

In applying wire lath to metal furring the lath should be tied in place and drawn tight to the furring with No. 18 gage annealed galvanized wire lacing. The tie wires should be given a double turn and the raw ends bent back flush with the face of the lath. Plain lath should be wired along each furring bar at about 6-inch intervals and stiffened lath should have each stiffener securely tied to each furring bar.

All end joints should be lapped at least 1 inch and the joints in adjacent sheets should be alternated so that they will not occur in the same line. Side joints should be lapped in such a way as to insure continuity of the lathed surface and should as a rule have a lap of not less than ½ inch. Side laps should preferably be made along a furring bar or support, but if made between furring they should be thoroughly laced together.

In applying wire lath to wooden supports, either against sheathing or to bare studs in walls and partitions, or against joists as in ceilings, the lath should be securely stapled in place with galvanized wire staples, which should be driven down so as to bring the lath to a secure bearing against the supporting background. In applying plain lath to wooden furring, it should be stapled along each furring strip at intervals of about 6 inches, while stiffened lath should have each stiffener stapled to each stud or joist. In case stiffened lath is applied directly to sheathing, each stiffener should be stapled both at the sides and at the center of the sheet.

In the following table are given quantities of wire lacing or wire staples required to apply 100 square yards of Clinton Wire Lath with various spacings of furring. In this table it is assumed that plain lath is wired or stapled to each furring strip at 6-inch intervals along its length, while stiffened lath is wired or stapled to each furring strip at 8-inch intervals along its length. The wire lacing for connection to metal furring is in each case No. 18 annealed galvanized wire and the staples are Clinton Galvanized Wire Staples, — ¾ inch No. 14 round top for plain lath and 1¼ inches No. 13 square top for stiffened lath.

Wire Lacing and Wire Staples Required to Apply 100 Square Yards of Clinton Wire Lath

Spacing of Furring	Plain Lath		V-Stiffened Lath	
	No. 18 Galvanized Wire Lacing	¾″ No. 14 Galvanized Wire Staples	No. 18 Galvanized Wire Lacing	1¼″ No. 13 Galvan. Wire Staples
12″ c/c	6 lbs.	4 lbs.	5½ lbs.	9½ lbs.
14″ c/c	5 lbs.	3½ lbs.	4½ lbs.	8 lbs.
16″ c/c	4½ lbs.	3 lbs.	4 lbs.	7 lbs.
18″ c/c	------	------	3½ lbs.	6 lbs.

How to Specify

In specifying wire lath it is essential to describe carefully the various necessary features of the lath in order to obtain the exact type and grade of material desired. The specification should always include the word "Clinton" in order to make sure of obtaining the standard recognized Clinton quality. The different types and grades of Clinton Wire Lath should each be specified as follows:

No. ____ gage Japanned Clinton Wire Lath.
No. ____ gage Clinton Wire Lath Galvanized-after-woven.
No. ____ gage V-Stiffened Japanned Clinton Wire Lath.
No. ____ gage V-Stiffened Clinton Wire Lath Galvanized-after-woven.

Unless otherwise specified, all Clinton Lath will be 36⅝ inches wide and woven with 2½ meshes per lineal inch. Other widths and meshes, however, may be obtained by special order.

How to Order

In ordering Clinton Wire Lath it is essential to give complete description of the size, type and grade of lath and also the quantity desired. The quantity may be ordered in square yards or in rolls thus:

Ship 666⅔ square yards of No. ____ gage Clinton Wire Lath Galvanized-after-woven.

Ship 10 rolls of No. ____ gage Clinton Wire Lath Galvanized-after-woven.

Unless otherwise specifically mentioned, plain lath will be shipped in rolls containing 200 lineal feet, while stiffened lath will be shipped in rolls containing 100 lineal feet. The stock width of 36⅝ inches is sold as 36 inches.

Shipping Weights of Clinton Wire Lath

Gage of Wire	Weight of One Roll of Plain Lath Containing 200 Lineal Feet, 36″ Wide		Weight of One Roll of V-Stiffened Lath Containing 100 Lineal Feet, 36″ Wide	
	Japanned	Galvanized	Japanned	Galvanized
No. 18	215 lbs.	270 lbs.	135 lbs.	175 lbs.
No. 19	165 lbs.	210 lbs.	110 lbs.	145 lbs.
No. 20	120 lbs.	165 lbs.	90 lbs.	125 lbs.
No. 21	100 lbs.	140 lbs.	80 lbs.	110 lbs.

3.33

Furring and Lathing Details

Ceilings

Wire lath and plaster ceilings are of two general types: the "clipped ceiling," wherein the furring bars are connected directly to the floor beams by means of clips, and the "suspended ceiling," wherein the furring is hung or suspended below the floor beams by means of suitable hangers. Wire lath and plaster ceilings should be designed to carry a load of from 10 to 15 pounds per square foot, depending somewhat upon the character of the ceiling. For the ordinary plain plastered ceiling, a load of 10 pounds is considered sufficient, whereas if heavy paneling or ornamentation is used, the load may in some cases be as much as 15 pounds per

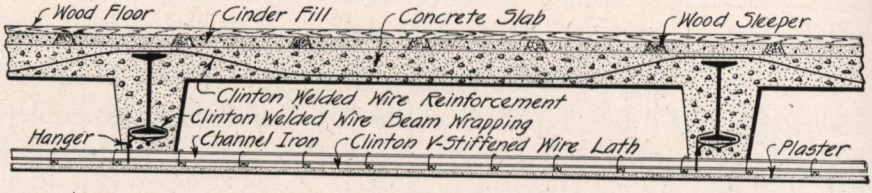


Fig. 1. Clinton Welded Wire and Clinton Wire Lath in Typical Fireproof Floor and Ceiling Construction

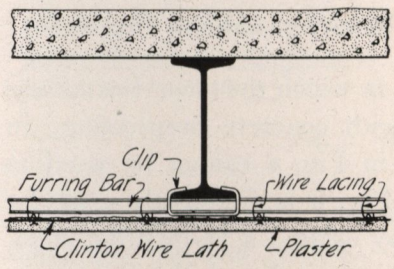
square foot. Unusual ornaments, lighting fixtures and other attachments, of course, require special provision for their support.

In view of the usual light loads, the question of absolute strength of furring is frequently of less importance in ceilings than that of stiffness and rigidity. It is essential that furring for ceilings be rigid and secure in order to prevent excessive deflection, which would tend to crack and dislodge the plaster. For the sake of rigidity, therefore, furring for ceilings is usually selected more from the standpoint of stiffness than from the question of actual strength.

The main furring bars, that is, those to which the lath is actually attached, consist usually of small channels or flats. The best practice limits the minimum size of these members to ¾-inch channels when the unsupported span length of the furring bar is 5 feet or less, and 1-inch channels when the unsupported span

length is from 5 to 7 feet. For spans greater than 7 feet it becomes necessary to increase the size of furring bars in proper proportion or use auxiliary hangers to provide intermediate supports.

The type of lath used determines usually the spacing of the furring bars, since they should be so spaced as to offer adequate support for the lath in order to prevent bulge or sag while the plaster is being applied. When plain lath is used, that is, lath without stiffening ribs, the furring members should in general be 12 inches apart, whereas the spacing may be 18 inches if the lath be provided with V-stiffeners. These V-shaped stiffening ribs, which are spaced 8 inches apart along the lath, are run transverse



Clips. 1½ x ⅛-inch prong clip or 1 x ⅛-inch P-clip.

Furring Bars. 1-inch or ¾-inch channels, depending upon span, spaced 12 inches if lath is plain or 18 inches if V-stiffened.

Wire Lath. Clinton Wire Lath No. 19 Plain or No. 20 V-Stiffened, either Japanned or Galvanized-after-woven.

Wire Lacing. No. 18 annealed galvanized wire.

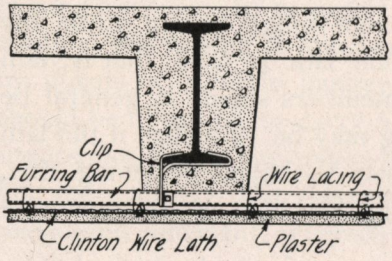
Fig. 2. Clipped Ceiling Attached Directly to Steel Beams

to the furring and serve the purpose of small secondary furring members, thus supporting the lath between furring bars.

The accompanying sketches are offered for the purpose of suggesting a few of the best details used in the construction of metal furring and wire lath ceilings. While in these various sketches the V-stiffened lath has been illustrated, it must be remembered that plain lath may in each case be similarly adapted, the only difference being that the furring bars should in that case be spaced 12 inches apart instead of 18 inches as shown and a heavier gage of wire used in the lath.

Fig. 2 illustrates a clipped ceiling with the furring located against the bottom flanges of the floor beams and attached to them by steel clips of the prong type. This clip, as shown in Fig. 4, is usually made of ⅛-inch flat steel of sufficient width to permit slotting for the furring bar and provide at least ½-inch width for

each prong to be bent around the beam. The P-clip, as shown in Fig. 5, is sometimes used for clipping furring directly to beams. This clip, which is usually made of 1 x ⅛-inch flat steel, clamps only one side of the flange and is not considered quite as desirable as other types which clamp around both sides of the flange.



Clips. 1 x ⅛-inch fork clip, either notched to receive furring bar or provided with bent knee or angle lug and ¼-inch bolt.

Furring Bars. 1-inch or ¾-inch channels, size depending upon span, spaced 12 inches if lath is plain or 18 inches if V-stiffened.

Wire Lath. Clinton Wire Lath No. 19 Plain or No. 20 V-Stiffened, either Japanned or Galvanized-after-woven.

Wire Lacing. No. 18 annealed galvanized wire.

Fig. 3. Clipped Ceiling Attached to Steel Beams with Concrete Fireproofing

Fig. 3 illustrates a clipped ceiling in which the floor beams are covered below the bottom flange with concrete fireproofing, in which case the prong clip as shown in Fig. 4 cannot be used to advantage. The clip illustrated in Fig. 6 is frequently used for this purpose. This clip is formed by using 1 x ⅛-inch flat steel, which is partially sheared in half at one end and the two parts

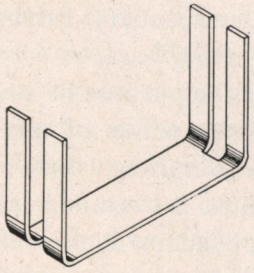


Fig. 4. Prong Clip

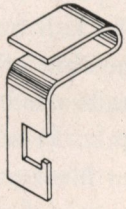


Fig. 5. P-Clip

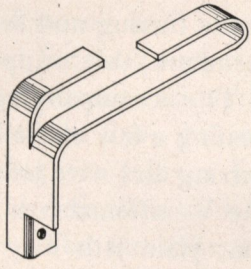
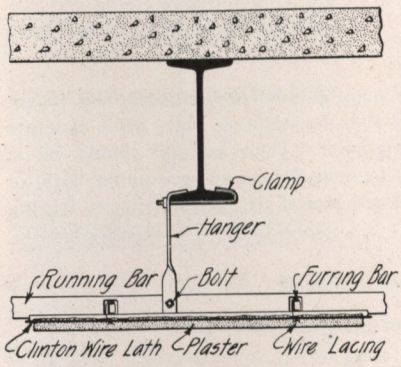


Fig. 6. Fork Clip

bent around the bottom flange as shown. If a bolt connection is desired, a small incut may be made at the lower end of the clip and the metal bent to form a bent knee for bolting to the furring bar. A suitable connection of furring bar to this type of clip is often accomplished by providing the lower end with a ridge or inset to receive the furring bar as illustrated by the P-clip in Fig. 5.

Clips for this purpose may also be made by using 1 x ⅛-inch flat steel in two parts, one part setting vertically and hooking over the flange, the other part extending along the bottom of the flange being bent around the flange at one end and being bent down and bolted to the vertical piece at the other end.



Hangers. 1 x 3/16-inch flat with ⅜-inch round rod clamp, threaded and provided with nut, or 1 x 3/16-inch flat clamp bolted to hanger.

Running Bars. 1½ x ¼-inch flats, spaced not more than 5 feet apart and bolted to hangers with ⅜-inch bolts.

Furring Bars. ¾-inch channels, spaced 12 inches if lath is plain or 18 inches if lath is V-stiffened. Furring bars bolted to, run through or clipped to running bars. (See Figs. 8, 9 and 10.)

Wire Lath. Clinton Wire Lath No. 19 Plain or No. 20 V-Stiffened, either Japanned or Galvanized-after-woven.

Wire Lacing. No. 18 annealed galvanized wire.

Fig. 7. Suspended Ceiling

Fig. 7 illustrates a suspended ceiling hung from the bottom flanges of the floor beams. Where ceilings are suspended below the floor beams, stiffness and rigidity of construction require that they be cross-furred. This is accomplished by supporting the

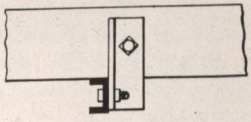


Fig. 8. Bolted

¾ x ¾ x ⅛-inch angle lug with ¼-inch bolts.

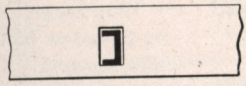


Fig. 9. Passed Through

Running bar punched to receive furring bar with snug fit.

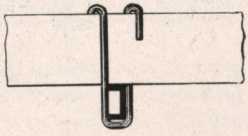


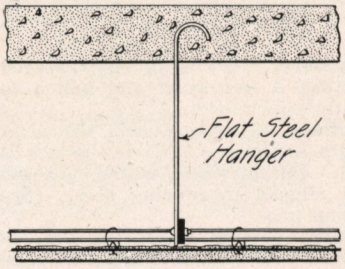
Fig. 10. Clipped

Hair-pin clip of No. 9 annealed galvanized wire.

Three Methods of Connecting Furring Bar to Running Bar

main furring members on running bars which are supported from the floor beams or floor slabs by hangers. These running bars, which are usually 1½ x ¼-inch flat steel or angles of suitable size, are spaced about 5 feet apart and serve as cross-furring to

support the main furring bars. In cross-furred ceilings the furring bars may be supported by being bolted to, run through or clipped to the running bars as shown in Figs. 8, 9 and 10. Furring bars should never be run through running bars unless the necessary punching does not cause undue weakening of the running bar. If this connection is used, the depth of the cut should be

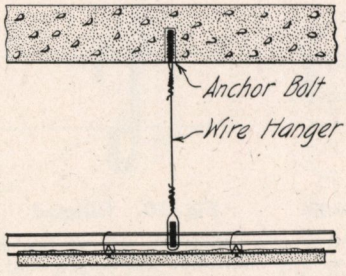


Either main or auxiliary hangers may be attached to slabs by setting in place while concrete is being poured. These hangers should be at least 1 x 3/16 inch if supporting running bars, or at least 1 x 1/8 inch if attached directly to furring bars.

Fig. 11. Flat Hanger Anchored in Concrete Slab

made just sufficient to admit the furring bar, thus obtaining a snug fit in order to prevent free play or movement between the two bars.

Where auxiliary hangers are desired for supporting furring between floor beams, or where it becomes necessary to support

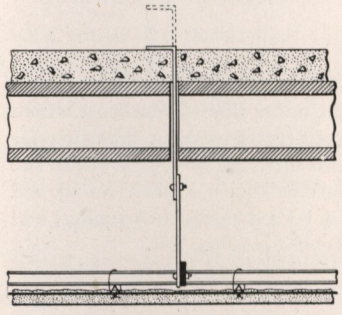


Wire hangers, attached to the slab by anchor or expansion bolts, are sometimes used for auxiliary hangers. The wire hanger works to best advantage in clipped ceilings, where the furring may be drawn up tight against the beams. Wire for hangers should be at least No. 10 annealed galvanized wire.

Fig. 12. Wire Hanger with Anchor Bolt Connection

the furring directly from the floor slab, these connections may be made by anchoring hangers in the concrete as shown in Fig. 11 or by wire hangers and anchor bolts as shown in Fig. 12. In suspended ceilings, however, the wire hanger is not considered good practice, as it has no stiffness except under direct tension.

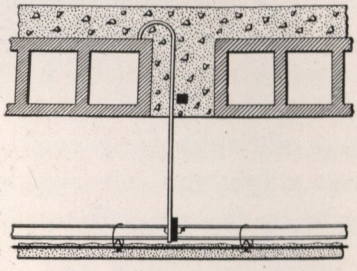
In case, however, the construction is a clipped ceiling, where the furring may be drawn up tight against the bottom flanges of the beams, the wire hanger can be used to advantage as it may then be drawn up tight and secure.



Bent flat steel as shown by dotted lines may be set on forms and driven down after forms are removed. An extension bar is then bolted to the lower end of this hanger and the ceiling construction hung as shown. Instead of using the bend a better connection is obtained with the so-called "toggle," which consists of a cross piece of small channel or flat bolted to top of hanger.

Fig. 13. Hanger Connection to Hollow Tile Floor

Figs. 13 and 14 illustrate the installation of hangers in combination floors of concrete and hollow tile. Fig. 14 shows the method of anchoring a hanger through the concrete rib, while Fig. 13 shows the method of anchoring on the top of a slab with the hanger extending between the ends of two adjacent tiles. In Fig. 13 the hanger with one end bent is set as shown by dotted lines between the tiles with the lower end resting upon the top of



In combination tile and concrete floors, hangers may be set through the concrete ribs by hooking on to the tile before concrete is poured. Connections between ribs may be made as shown in Fig. 13.

Fig. 14. Hanger Connection to Combination Floors

the forms. When the forms are removed, the hanger is driven down until the hook comes in contact with the slab and the ceiling construction bolted to the lower end of the hanger as shown. Instead of anchoring the top of the hanger by bending, a stronger

and better connection may be obtained by using the so-called "toggle," which merely consists of a cross piece of small channel or flat steel riveted to the top of the hanger.

Fig. 15 illustrates a method of connecting hangers to the under-

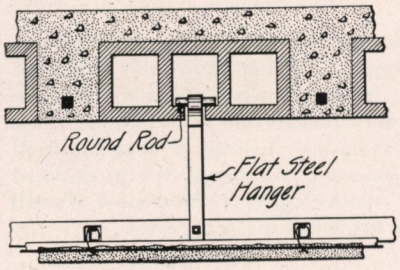


Fig. 15 illustrates a method of connecting hangers to the under side of tile floors which have been constructed without provision for ceiling attachments. An opening is cut in the lower web of the tile, a ½-inch round rod inserted, then turned across the opening, and the hanger hooked over the rod.

Fig. 15. Connection to Completed Tile Floors

side of tile floors which have been constructed without provision for ceiling attachments. This is accomplished by cutting an opening in the lower surface of the tile through which a small round rod may be inserted. The length of this opening should be about equal to the length of the rod, while the width should be just slightly greater than the width of the hanger. The rod is inserted in the tile, then turned so as to cross the opening, and the hanger hooked over the rod as shown.

Partitions

Steel studding, consisting of channels or other shapes, covered with Clinton Wire Lath and plaster, affords a light and substantial type of fireproof construction which may be readily adapted to all classes of partitions.

In partitions the minimum size of studs is of course determined by the size necessary to give the required lateral stiffness, but the actual size is more often fixed by the desired thickness of the partition wall. The spacing of studs is usually determined by the type of lath used, as they should be so spaced as to offer adequate support for the lath, in order to prevent bulge or bag while

plaster is being applied. When plain lath is used, that is, lath without V-stiffening ribs, the studs should be spaced from 12 to 16 inches apart, whereas the spacing may be 18 inches if the lath be provided with V-stiffeners.

The studs should be securely connected top and bottom to the floor slabs by means of bent knees or angle lugs. These connections, which may be made directly to the concrete by means of suitable expansion bolts, are more often made by lag screws connecting to a wooden strip or by bolts connecting to a steel strip or runner plate. Wooden blocks or a wooden strip may be set at the base of the studs to receive nailing for the base-board and, at the proper height in the partition, a wooden strip is set to receive the chair rail. Doors are framed by means of angles extending the full height of the partition and secured to the floor slabs top and bottom by means of angle lugs. A cross brace of flat steel is set at the top of the door openings and bolted at each end through bent knees to the framing angles.

The accompanying sketches are offered for the purpose of suggesting a few details involved in the erection of metal furring and wire lath partitions. While in these various sketches V-stiffened lath has been illustrated, it must be remembered that plain lath may in each case be similarly adapted by spacing the studs 12 to 16 inches apart instead of 18 inches as shown and using a heavier gage of wire in the lath.

Where a thin wall is desired the 2-inch solid partition as shown in Fig. 16 is extensively used. In this partition the studding consists of ¾-inch channels with door frames of heavier 1-inch angles, to one side of which is applied Clinton V-Stiffened Wire Lath. The lathed side of the partition is then covered with ⅝ inch of plaster and the other side back-plastered to a thickness of ¼ inch beyond the studs, thus giving a total solid plastered thickness of 2 inches. The ¾-inch studding may be utilized in this type of partition for a height up to 12 or 14 feet, but for greater heights it becomes necessary to increase the size of the studs usually to 1 inch. If V-stiffened lath is used in conjunction with 1-inch studding, the partition must finish 2¼ inches thick in order to have ⅝ inch of plaster on the lath side and have the studs cov-

ered with ¼ inch on the other side. By using plain wire lath, that is, lath without stiffeners, this partition may be finished 2 inches thick, even with 1-inch studding.

The hollow wire lath and plaster partitions as shown in Figs. 17 and 18 may be adapted to so many different requirements that they may be used to splendid advantage where walls vary in thickness or where the wall line is broken up by pilasters, curved surfaces and niches. The 4-inch hollow partition shown in Fig. 17 is extensively used. It consists of 2-inch channel studding connected to the floor slabs by bent knees or angle lugs and covered on both sides with wire lath and plaster. The hollow partition in Fig. 18, shown as 6 inches thick, may, of course, be given any desired thickness and is used to splendid advantage where the partition wall serves to enclose pipes, wiring and other hidden members. Where the partition thickness exceeds 4 inches, it is usually desirable to erect the studding in two lines, each line consisting of 1 x 1 x ⅛-inch angles properly braced at intervals by steel separators. The studs are connected top and bottom to the floor slabs by means of angle lugs and wire lath and plaster applied to both sides.

Another form of partition sometimes employed is the filled partition as shown in Fig. 19. This consists of an ordinary hollow wire lath and plaster partition with a cinder concrete filling. This partition is frequently used to divide a building into definite sections serving the purpose of a fire wall. Such a partition equipped with fire doors will provide an absolute fire stop and is extensively used to enclose interior stair wells designed to serve as fire-escapes.

Fig. 20 illustrates the Flagg wire partition invented by Mr. Ernest Flagg, architect, 109 Broad Street, New York City. In this partition the furring consists of No. 14 galvanized wire, secured top and bottom to the floor slabs and tightly stretched by drawing adjacent strands of wire together with tie wires as shown. This tightly stretched wire fabric is then covered with wire lath and plaster applied to the required thickness.

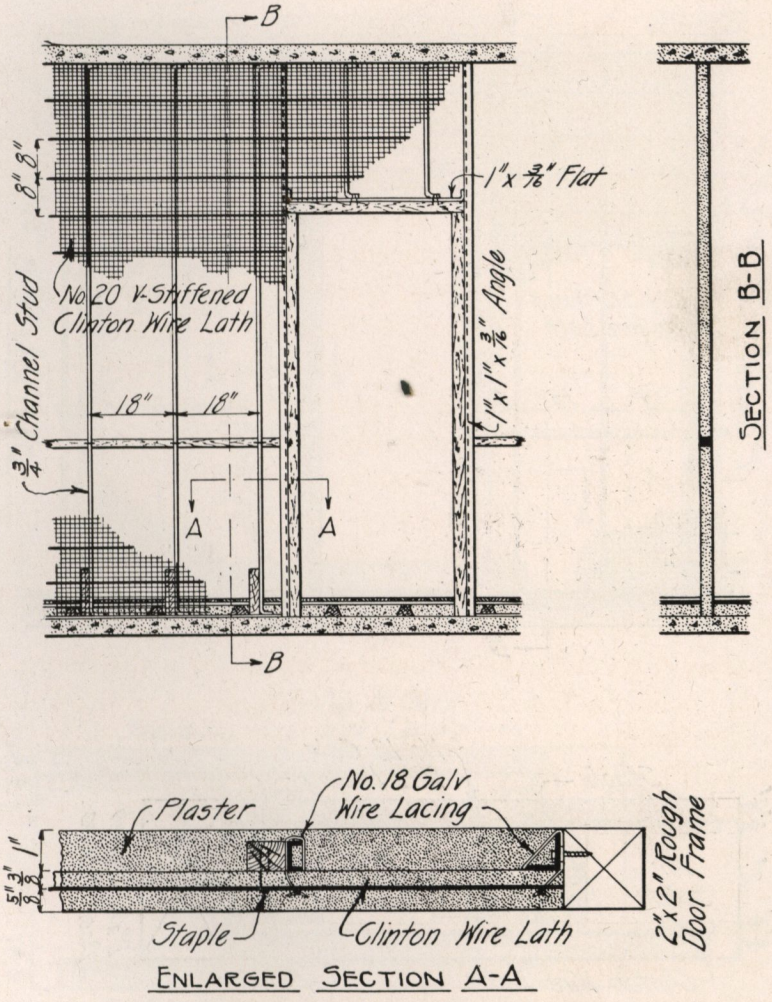


Fig. 16. Two-Inch Solid Partition

NOTE. Plain lath may be used instead of V-stiffened, in which case a No. 19 gage should be used and the studs spaced not more than 14 inches apart. With a plain No. 18 gage, studs may be spaced 16 inches apart.

Either the Japanned or Galvanized-after-woven grade of lath should be used.

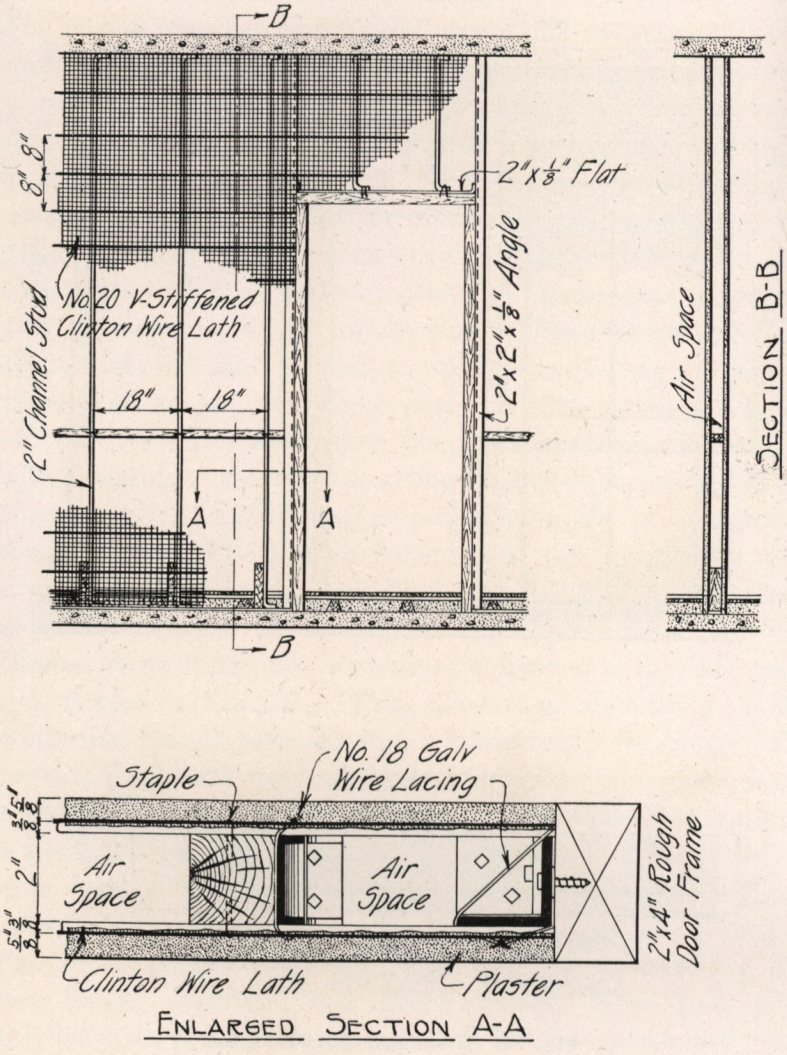


Fig. 17. Four-Inch Hollow Partition

NOTE. Plain lath may be used instead of V-stiffened, in which case a No. 19 gage should be used and the studs spaced not more than 14 inches apart. With a plain No. 18 gage, studs may be spaced 16 inches apart.

Either the Japanned or Galvanized-after-woven grade of lath should be used.

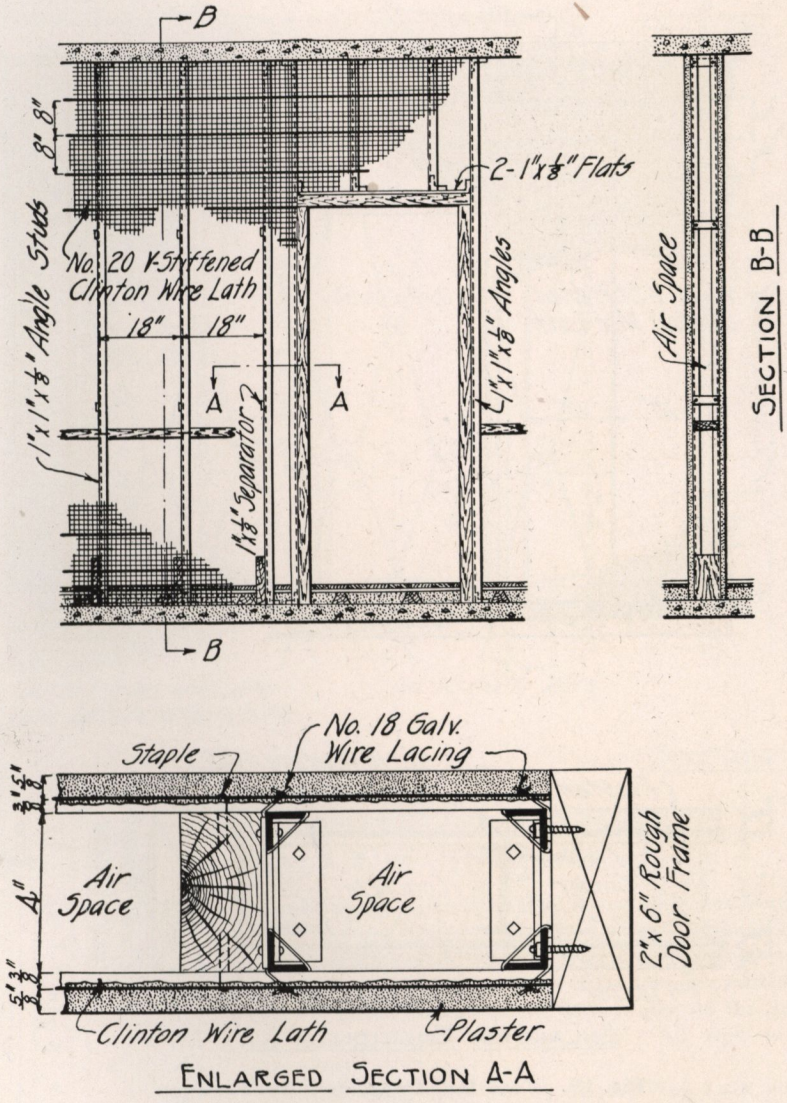


Fig. 18. Six-Inch Hollow Partition

NOTE. Plain lath may be used instead of V-stiffened, in which case a No. 19 gage should be used and the studs spaced not more than 14 inches apart. With a plain No. 18 gage, studs may be spaced 16 inches apart.

Either the Japanned or Galvanized-after-woven grade of lath should be used.

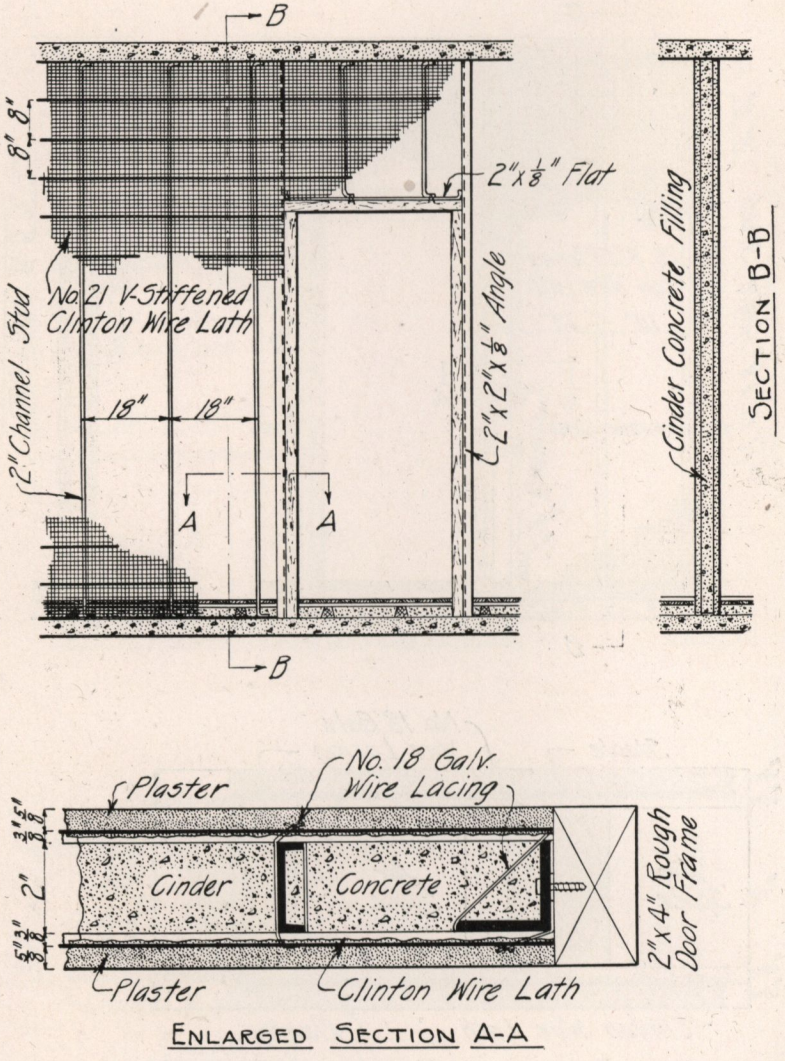
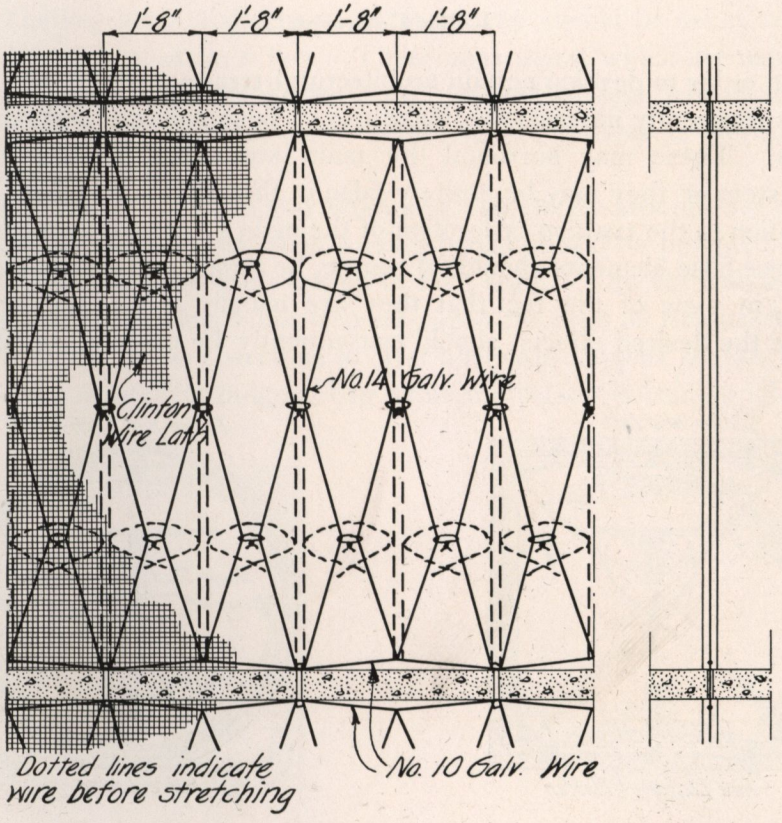


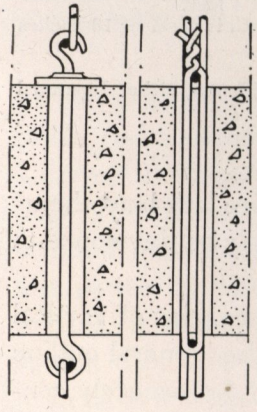
Fig. 19. Four-Inch Concrete-Filled Partition

NOTE. Plain lath may be used instead of V-stiffened, in which case a No. 20 gage should be used and the studs spaced not more than 14 inches apart. With a plain No. 19 gage, studs may be spaced 16 inches apart.

Either the Japanned or Galvanized-after-woven grade of lath should be used.



ELEVATION SECTION



TWO TYPES OF FASTENERS

Specification

Between the hooks, spaced 40 inches apart and secured to the floor and ceiling construction, stretch a No. 00 gage wire horizontally at floor and ceiling, and to these wires and the hooks stretch two wires of No. 14 gage vertically, every 20 inches drawn together as indicated on the drawing until thoroughly stiff and rigid. All wire to be galvanized.

On this wiring apply No. 19 Clinton Wire Lath, either Japanned or Galvanized, well lapped and tied in place with No. 18 annealed galvanized wire lacing.

Fig. 20. Flagg Wire Partition

Patented by Ernest Flagg, Architect, 109 Broad Street, New York City

False Columns

In order to develop certain architectural treatments of interiors, it is frequently necessary to make use of false columns and pilasters. These may surround the main structural columns and pilasters or they may be entirely false in themselves and bear no relation to the position or location of the main structural members. These false elements should, of course, be strong and substantial; but, in view of the fact that they are usually large in order to give the desired effects, should consequently be made of as light

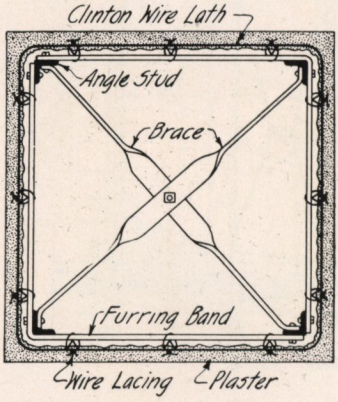


Fig. 21. Square Column

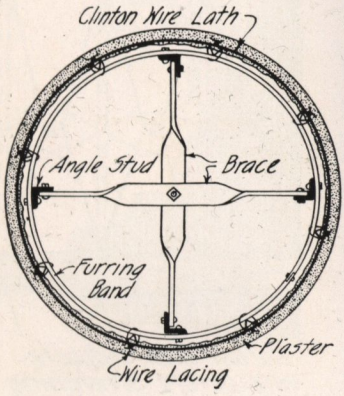


Fig. 22. Circular Column

Studs. 1 x 1 x ⅛-inch angles (at at least 4 per column).
Braces. 1 x ⅛-inch flats placed at vertical intervals of about 4 feet.
Furring Bands. 1 x ⅛-inch flats spaced 14 inches apart if lath is plain or 18 inches if V-stiffened.
Bolts. ¼-inch diameter.
Wire Lath. Clinton Wire Lath No. 19 Plain or No. 20 V-Stiffened, either Japanned or Galvanized-after-woven.
Wire Lacing. No. 18 annealed galvanized wire.

construction as possible. Metal furring and wire lath lend themselves readily to this class of construction and may be developed to meet any requirement of architectural design.

Furring for false columns should consist of a series of vertical studs arranged in such a way as to conform to the general outline of the finished column, and these studs should be securely connected top and bottom to the floor slabs by means of angle lugs and bolts or lag screws. At intermediate points between floor

and ceiling horizontal separators or braces should be set at vertical intervals of about 4 feet. These separators, which are usually made of flat steel, should be securely bolted to each pair of studs and also bolted together at the center of the column as shown in Figs. 21 and 22.

Encircling the studs and extending completely around the outline of the column, flat steel furring bands should be provided and these should be securely bolted to each stud. The vertical spacing of these furring bands depends upon the type of lath used, as they should be so spaced as to offer adequate support to the lath in order to prevent bulge or bag while the plaster is being applied.

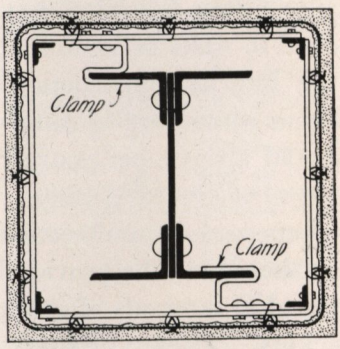


Fig. 23. Square Column

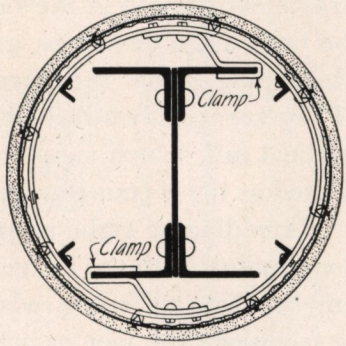


Fig. 24. Circular Column

Clamps. 1 x ¼-inch flats with 2 bolts per clamp.
Furring bands, bolts, wire lath and wire lacing same as in Figs. 21 and 22.

When plain lath is used, that is, lath without V-stiffening ribs, these bands should have a spacing of from 12 to 16 inches, whereas the spacing may be 18 inches if the lath be provided with V-stiffeners. The exterior of this framework may then be covered with wire lath, which should be securely wired in place and plaster applied to the required thickness. If V-stiffened lath is used, it should be placed with the stiffeners running vertically so that they will span the openings between furring bands.

In case it is desired to surround a structural steel column with a false outline, a similar construction may be used except that the interior separators or braces are omitted and steel clamps provided

as shown in Figs. 23 and 24. These clamps should be made of flat steel not less than ¼ inch thick, so that, when bent and clamped to the column, they will have sufficient stiffness to brace and support the furring.

False Beams and Cornices

Furring for false beams and cornices consists of steel brackets, which are bent or shaped so as to conform to the general outline of the finished beam or cornice. These brackets are usually made of flat steel or small channels and may have numberless shapes and arrangements depending upon the particular architectural treatment desired in the beam or cornice. These brackets may be hung from beams or girders or attached to walls or columns, depending upon the arrangement of the interior construction. They are usually attached top and bottom to some sort of longitudinal rail, which supports them and should always be securely bolted at these connections.

Extending at right angles to the brackets and in a direction longitudinal with the beam or cornice there should also be provided intermediate stiffening rods, which are spaced at intervals of about 2 feet along the face or outline of the brackets. These stiffeners, which are usually ⅜-inch round rods, serve to brace and hold the brackets in position and should be securely wired to each bracket.

Wall Surfaces

Where the condition of a wall surface is such that plaster cannot be directly applied thereto, or in cases where it is desired to have an air space between the plaster and the wall, it becomes necessary to fur the surface and apply wire lath and plaster. This is commonly done by setting vertical furring members of small channels or flats, which will give the required offset from the wall. This furring is attached top and bottom to the floor slabs and supported laterally at intervals by means of angle lugs attached to the wall surface. This method of furring is described in detail in the specifications on page 57.

The crimped wire furring illustrated in Fig. 25 offers a method of furring wall surfaces which has proved to be far superior to any other method in use. This furring consists of the well-known Clinton Electrically Welded Wire, the transverse wires of which are crimped so as to give the heavier longitudinal wires the required offset from the wall surface. These offset wires run vertically with the wall and serve as the furring ribs to which the lath is attached. The great advantage of this furring lies in the fact that it can be given practically any amount of offset with un-

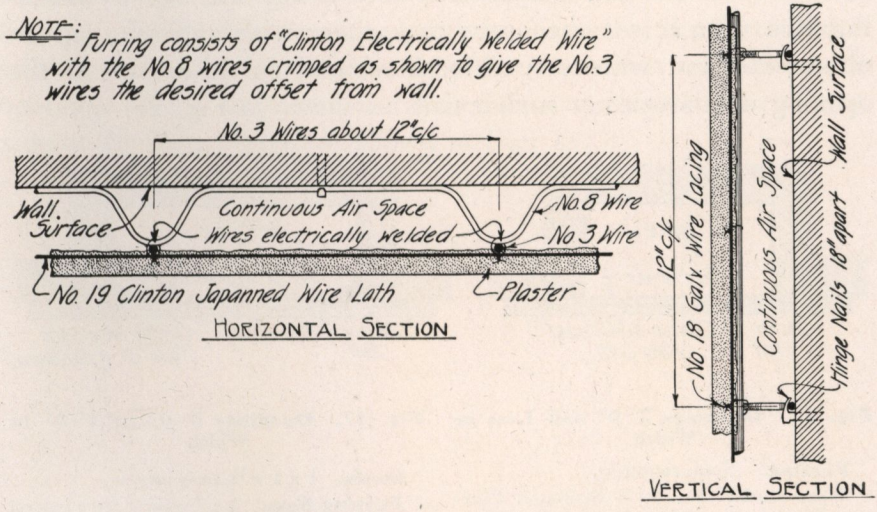


Fig. 25. Clinton Welded Wire Wall Furring

obstructed air space, which is especially worthy of consideration in case it is desired to run pipes or wiring in the air space between the plaster and the wall.

When walls are furred vertically or horizontally with channels or angles the air space behind the plaster is usually broken up or divided by these furring members in such a way that pipes or wires cannot be conveniently run except in definite vertical or horizontal lanes. With this Clinton Crimped Wire furring, however, a free continuous air space is obtained with no vertical or horizontal obstructions, thus permitting the free extension of pipes or wires in

any direction throughout the air space. This material, which may be crimped for any desired offset, may be obtained in sheets up to 20 feet in length and 7 feet in width and may be obtained cut to any desired size within these limits.

Chases and Air Ducts

Pipe chases, air ducts and other openings or recesses which do not exceed 2 feet in width may be lathed by the direct application of Clinton V-Stiffened Wire Lath without the use of any furring. In such cases the lath is applied in such a way that the V-stiffening ribs span across the space or opening with sufficient lap on either side, and with each stiffener secured on either side of the opening with staples or anchor nails as shown in Fig. 26.

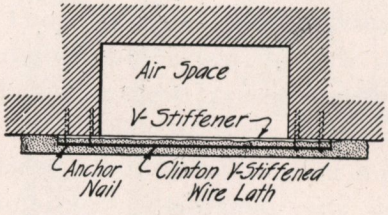


Fig. 26. Openings 2′ 0″ and Less in Width

Furring. None required.

Wire Lath. No. 20 V-Stiffened Clinton Wire Lath, either Japanned or Galvanized-after-woven.

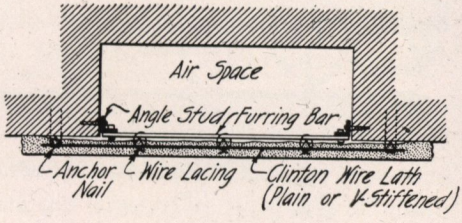


Fig. 27. Openings 2′ 0″ to 4′ 0″ in Width

Studs. 1 x 1 x ⅛-inch angles.

Furring Bars. 1 x 3/16-inch flats bolted with ¼-inch bolts and spaced 14 inches apart if lath is plain or 18 inches if V-stiffened.

Wire Lath. Clinton Wire Lath No. 19 Plain or No. 20 V-Stiffened, either Japanned or Galvanized-after-woven.

Wire Lacing. No. 18 annealed galvanized wire.

Pipe Chases and Air Ducts

In case the opening exceeds 2 feet in width it should be furred, as shown in Fig. 27, by setting angle studs along each side of the opening with the outstanding leg flush with the wall surface and the other leg secured to the wall with suitable anchor nails. Extending across the opening and bolted to the outstanding legs of

the vertical angles there should be provided furring strips which are usually made of 1 x 3/16-inch flat steel. These strips should be set at vertical intervals of from 12 to 16 inches if plain lath is used, whereas their spacing may be 18 inches if the lath is provided with V-stiffeners. To this furring wire lath is then applied and wired in the usual manner with at least a 4-inch lap on the wall at each side of the opening.

These flat steel furring bars will usually be sufficient for openings which do not exceed 4 feet in width. For wider openings the furring bars may be 3/4-inch angles with the horizontal leg turned in and the vertical leg bolted to the inside faces of the stud angles. For extremely wide openings, however, the furring and lathing should be done practically as for a partition wall and such openings should be furred and lathed in a manner similar to one side of the hollow partition shown in Fig. 18.

Specifications for Interior Furring and Lathing

General Requirements

Intent It is the intent of this specification to include the furnishing of all labor, materials, apparatus, ladders, scaffolding, hoisting and cartage necessary to supply, erect and complete all furring and lathing, including all clips, hangers, attachments and connections required to construct a substantial and proper foundation for plastering.

It is to be understood that all sizes and dimensions as hereinafter specified shall be subject to change and variation as may be required to meet special conditions, for in all cases the construction shall be of such strength, arrangement and design as will at all times meet the approval of the architect.

Furring in General All furring shall be done with suitable steel shapes, accurately bent, lined, leveled or plumbed to the forms required. All members must be erected and assembled in a rigid and secure manner, and must be securely connected together with suitable clips, bolts or rivets. All materials used for furring shall be dipped before assembling in lead and oil paint, composed of pure, dry, red lead and boiled linseed oil or other approved protective coating. Any furring showing signs of rust must be thoroughly cleansed of scale and then painted.

All furring shall be erected and assembled in a secure and workmanlike manner, and shall be so located that when the wire lath is attached thereto the lath will trim to a surface which shall in no place be less than 5/8 inch from the finished plaster face.

Wire Lath The lath throughout shall consist of No. 20 gage Clinton Wire Lath woven with 2½ meshes per inch. All lath shall be thoroughly galvanized. (*If galvanizing is not desired, substitute word* "japanned" *for words* "galvanized after woven.") The lath shall be provided with V-stiffening ribs, the depth of which shall be not less than 3/8 inch beyond the face of the lath. These ribs shall be securely clamped to the transverse wires, and shall extend across the full width of the fabric at intervals not exceeding 8 inches.* (*These last two sentences may be omitted if the stiffened type is not desired.*)

*NOTE. This specification for No. 20 gage V-Stiffened Galvanized Lath is merely offered for suggestion. For specifying other grades and sizes, see page 27.

Laps

All lath shall be lapped at least 1 inch where end joints are made, and at the sides of the sheet shall be lapped and tied in such a manner as to provide secure and unbroken continuity to the lathed surface.

Wire Lacing

Lath shall be securely tied or laced to furring, as hereinafter specified, with No. 18 gage annealed galvanized wire, and the ends of all ties shall be secured by a double turn and bent back flush with the face of the lath.

Workmanship

All lath shall be tightly drawn with proper tools and shall finish smooth and true to the required lines without bag, bulge or sag. All nuts shall be tightly drawn and all lath securely wired before plastering is begun.

All furring, cross-furring, studs, frames, brackets and lath shall be true, exact and rigid, and all necessary supports, connections and attachments shall be supplied and erected as required, leaving all surfaces in proper condition to receive the plaster.

All furring and lathing, of whatever kind or description, shall be done with such materials and be of such arrangement and design as will meet the approval of the architect, and all labor in connection therewith shall be performed by skilled and experienced workmen, in accordance with the best practice and requirements of the trade.

Ceilings

Size of Furring

Furring for ceilings shall be done with suitable channels, angles, tees or flats of such size and strength as will adequately support the depending loads. All furring and supports for same shall be of sufficient strength to sustain a load of at least 10 pounds per square foot of plastered surface, and all furring members shall have such stiffness that they will not deflect more than $\frac{1}{360}$ of the span under the final load which they are required to sustain.

Furring bars shall in no case be less than $\frac{3}{4}$ inch channels or their equivalent for spans up to 5 feet, nor less than 1 x $\frac{3}{8}$ x $\frac{1}{8}$ inch channels or other approved sections of equivalent strength for spans up to 7 feet. For spans exceeding 7 feet, the sectional area and strength of furring bars shall either be increased in proper proportion or they shall be pro-

vided with intermediate supports consisting of clips or hangers securely fastened to or anchored in the floor construction above.

In all cases where heavy ornamentation or other special attachments are called for, special provision shall be made to sustain the loads imposed.

Suspended Ceilings When ceilings extend more than 6 inches below the floor beams, they shall be considered as suspended ceilings and shall be properly cross-furred by means of running bars which shall receive and support the furring bars.

Running Bars Suspended ceilings shall be provided with continuous running bars extending either transversely to or parallel with the floor beams and properly suspended by hangers from the beams or floor construction as may be required. These running bars, which shall be spaced not more than 5 feet apart, shall be of such size and strength as to adequately support the loads imposed, but shall in no case be less than 1½ x ¼ inch flat steel or other approved shapes of equivalent size and strength.

Connection of Furring Bars to Running Bars In suspended ceilings the furring bars shall be securely bolted or clipped to or passed through the running bars. If running bars and furring bars are bolt-connected, the bolts for such connections shall be ¼ inch diameter, or if hairpin clips are used they shall be of No. 9 annealed galvanized wire and shall pass up on both sides of the furring bars and be securely hooked over the running bars. If furring bars are passed through running bars. They shall fit snug in the openings provided to receive them in order to prevent undue play or movement of the bars.

Spacing of Furring Bars The spacing of furring bars in both clipped and suspended ceilings shall depend upon the type of lath used, but shall not be more than 12 inches when the lath is plain nor more than 18 inches when the lath is provided with V-stiffeners.

Clips Clips used for the purpose of receiving and supporting furring bars for ceilings shall be made from not less than 1 x ⅛ inch flat steel, but must in all cases be of sufficient strength to sustain the loads imposed and of such fabrication and design as will meet the approval of the architect. All clips attached to steel beams shall be of the forked or clamped type

and must be securely fastened over both sides of the bottom flange of the beam. Unless other secure and approved means be provided for receiving and supporting furring bars, the lower ends of clips shall be punched for and provided with ¼ inch diameter bolts for attaching furring to same.

Hangers

In suspended ceilings the main running bars shall be suspended from the floor construction above by means of hangers which shall be not less than 1 x 3/16 inch flat steel, but which in all cases shall be of such strength, fabrication and design as to adequately support the loads imposed. All hangers attaching to steel beams shall be of such a type that they will securely clamp on both sides of the bottom flange. At their lower ends, hangers shall be punched for and provided with ⅜ inch diameter bolts for securing the furring to same and shall be of varying lengths so that any variation may be taken up and the wire lath ceiling made firm and secure to the proper lines.

Auxiliary Hangers

Auxiliary hangers shall be prroided for furring bars in clipped ceilings and for running bars in suspended ceilings at points where the strength and rigidity of the construction requires intermediate supports between floor beams. These hangers shall be not less than 1 x ⅛ inch flat steel when supporting furring bars as in clipped ceilings, nor less than 1 x 3/16 inch flat steel when supporting running bars as in suspended ceilings, but must in all cases be of such size and strength as is required to sustain the depending loads. Such hangers shall be provided at their upper ends with suitable means for attaching to or anchoring in the floor construction, and at their lower ends shall be punched for and provided with suitable bolts for connecting furring to same. These bolts shall be ¼ inch diameter for hangers supporting furring bars as in clipped ceilings and ⅜ inch diameter for hangers supporting running bars as in suspended ceilings.

Connection to Concrete or Wooden Beams

All hangers and clips which do not attach to steel beams must in the case of concrete beams be securely anchored therein or in the case of wooden beams be securely spiked thereto.

Application of Lath

After all furring has been set to the proper lines and all parts have been erected and assembled in a rigid and secure

manner, the ceiling surface shall be covered with wire lath which shall be stretched smooth and true to the proper lines and securely wired in place as hereinbefore specified.

Plain lath shall be tied or laced to furring at least every 6 inches along each furring bar, and lath provided with V-stiffeners shall have each stiffener tied or laced to each furring bar. At lapped joints between furring bars similar ties shall be provided.

Partitions

Size of Studs All studding for partitions shall consist of suitable channels, angles, tees or flats of such size and strength as will produce and maintain a stiff and rigid partition wall, but shall in no case be less than ¾ inch channels or other approved shapes of equivalent size and strength.

Arrangement of Studs In solid partitions the furring shall consist of a single line of vertical studs set plumb and true to the proper lines and of such size as will give the required thickness to the finished partition wall.

In hollow partitions the furring may consist either of a single or a double line of vertical studs set plumb and true to the proper lines. If a single line of studs be used, they shall be of such strength as will provide the required stiffness and rigidity of construction and of such width or depth as will give the required thickness to the finished partition wall. If a double line of studs be used, the two lines shall at all times be maintained the proper distance apart in order to obtain the required air space within the partition and also give the proper thickness to the finished partition wall.

Supports for Studs All studs shall be securely fastened to the floor and ceiling construction by bent knees, slotted clips or runner plates of approved type.

Runner Plates Where runner plates are used, they shall be not less than 1 x ⅛ inch flat steel or 1 x 1 x ⅛ inch angles, but must in any case be of sufficient size, strength and width to receive and hold the studs in such a manner as to obtain rigid and secure supports for same.

Runner plates must be securely clamped or fastened to the floor beams by suitable attachments or must be securely con-

nected to floor and ceiling construction by means of expansion bolts or anchor nails of approved type. If a double line of studs be used, and if these are connected top and bottom to runner plates, two lines of such plates shall be provided both top and bottom, that is, one for each line of studs, and these plates shall be absolutely parallel and shall be maintained the proper distance apart.

Separators

When two lines of studs are used, all studs in addition to being bolted or otherwise securely connected to the ceiling and floor construction must be braced and stiffened also by means of separators connecting the studs of one line with the corresponding studs of the other. These separators which shall not be less than 1 x ⅛ inch flat steel shall be spaced at intervals of not more than 5 feet vertically, and shall be securely bolted to the studs with ¼ inch diameter bolts.

Frames for Openings

Frames for doors, windows and other openings shall consist of suitable channels, angles, tees or other approved shapes assembled in a rigid manner and securely bolted in place. All frames for openings must be true in size and shape, must have correct location and position as indicated on the plans or as may be directed by the architect and shall be provided with 3/16 inch round holes punched 18 inches apart to receive bolts for attaching wooden bucks as previously set under "Carpenter's Specifications."

Spacing of Studs

The spacing of the studs in a direction longitudinal with the length of the partition wall shall depend upon the type of lath used, but in no case shall such spacing be more than 16 inches when plain lath is used, nor more than 18 inches when the lath is provided with V-stiffeners.

Temporary Bracing

During the construction of solid partitions, studs shall be braced laterally at points intermediate between floor and ceiling by means of temporary supports which shall remain in place until the scratch coat of plaster has been applied to one side of the partition and has become set. In the construction of hollow partitions, similar temporary bracing shall be provided in all cases where in the opinion of the architect such bracing is necessary to insure satisfactory and substantial construction.

Application of Lath

After all furring has been set to the proper lines and all parts have been erected and assembled in a rigid and secure manner, the studs shall be covered with wire lath which shall be stretched smooth and true to the proper lines and securely wired in place as hereinbefore specified.

The lath shall, in solid partitions, be applied only on one side of the studding, and, in hollow partitions, be applied on the outside of each line of studs when two lines are used, and on both sides of the studs when one line is used.

Plain lath shall be tied or laced to each stud at least every 6 inches vertically and lath provided with V-stiffeners shall have each stiffener tied or laced to each stud. At lapped joints between studs similar ties shall be provided.

False Columns

Size and Arrangement of Studs

Furring for false columns shall consist of suitable channels, angles, tees, flats or built-up sections of such strength and arrangement as will provide a firm and secure foundation for the plaster or ornamental covering. In all false columns each column shall enclose at least four vertical studs which shall in no case be smaller than 1 x 1 x ⅛ inch angles or other approved shapes of equivalent size and strength. These longitudinal studs shall be set true and plumb and shall be accurately spaced and arranged in such a way as to conform to the general outline of the finished column.

Supports for Studs

All studs shall be securely bolted or anchored to the floor and ceiling construction by means of bent knees, clips or other suitable connections and shall be properly braced and supported laterally at intervals by means of horizontal spacers or separators of proper arrangement and design.

Separators

Separators shall consist of at least 1 x 3/16 inch steel flats, which shall be cut to proper lengths so that they will extend between each pair of studs on opposite sides or corners of the column and shall be securely bolted to the studs with ¼ inch diameter bolts. Where these braces of flat steel cross at the center of the column, they shall be turned horizontally flat at their intersection and securely bolted together with ¼ inch diameter bolts. These separators or cross-braces shall be spaced and

arranged in such a way as to provide proper stiffness and rigidity to the framework, but shall in no case be spaced more than 4 feet apart vertically.

Furring Bands

Encircling the studs and extending completely around the outline of the column, there shall be provided 1 x ⅛ inch steel bands securely bolted to each vertical stud with ¼ inch diameter bolts and accurately bent or lined to conform to the outline of the finished column.

Spacing of Furring Bands

The vertical spacing of these furring bands shall depend upon the type of lath used, but shall not in any case be more than 16 inches if plain lath is used, nor more than 18 inches if the lath is provided with V-stiffeners.

Connection to Steel Columns

In all cases where false columns enclose structural steel columns, the horizontal spacers or separators, as herewith specified under "Separators," shall be omitted and the furring framework be provided with proper interior attachments securely connected to the structural steel column, as indicated on the architect's plans.

Application of Lath

After all furring has been set plumb and true to the proper lines and all parts have been erected and assembled in a rigid and secure manner, the exterior of the framework shall be covered with wire lath, which shall be stretched smooth and true to the proper lines and securely wired in place as hereinbefore specified.

Plain lath shall be tied or laced to each furring band at least every 6 inches around the outline of the column, and lath provided with V-stiffeners shall have each stiffener tied or laced to each furring band. At lapped joints between furring bands similar ties shall be provided.

False Beams and Cornices

Furring Brackets

Furring for false beams and cornices shall consist of steel brackets accurately bent and shaped so as to conform to the general outline of the finished beam or cornice. These brackets shall be formed with channels, angles, tees or flats of proper size and strength to adequately support the depending load, but shall in no case be formed with less than ¾ inch channels or other approved shapes of equivalent size and strength.

All brackets must be so formed as to constitute rigid and secure frames for supporting the plaster covering, and shall be securely bolted top and bottom to the longitudinal supporting rails with ¼ inch diameter bolts.

Longitudinal Rails Extending at right angles to the brackets and in a direction longitudinal with the beam or cornice which is being furred, there shall be provided a top and bottom rail which shall be of proper size and strength to receive and support the bars of which the brackets are formed. These rails shall in no case be less than 1 x 3/16 inch flat steel, or other approved shapes of equivalent size and strength, and shall be securely connected to or supported from the beams, walls or ceiling by means of clips, bolts or hangers.

Stiffening Rods Extending at right angles to the brackets and in a direction longitudinal with the beam or cornice which is being furred, there shall be provided continuous intermediate stiffening rods spaced at intervals not exceeding 2 feet along the face or outline of the brackets. These stiffening members shall consist of ⅜ inch round rods, and each rod shall be securely wired to each bracket.

Spacing of Brackets The spacing of furring brackets shall depend upon the type of lath used, but in no case shall the spacing be more than 12 inches when plain lath is used, nor more than 18 inches when the lath is provided with V-stiffeners.

Application of Lath After furring brackets and stiffening bars have been set fair and true to the proper lines, and all parts have been erected and assembled in a rigid and secure manner, the furring shall be formed smooth and true to the proper lines and securely wired in place, as hereinbefore specified.

Plain lath shall be tied or laced to each furring bracket at least every 6 inches around the face or outline of said bracket, and lath provided with V-stiffeners shall have each stiffener tied or laced to each furring bracket. At lapped joints between brackets similar ties shall be provided.

Wall Surfaces

Crimped Wire Furring Brick, masonry or concrete walls shall be furred with "Clinton Crimped Welded Wire" furring, consisting of No. 3 gage wires on 12 inch centers cross welded with No. 8

gage wires on 12 inch centers. The No. 8 wires shall be crimped so as to offset from the plane of the No. 3 wires a sufficient distance to provide the required space between the wall and the plaster, as called for on the plans or as may be directed by the architect, but this offset shall in no case be less than 1 inch.

Connection to Wall

The welded furring shall be set in such a way that the crimped No. 8 gage wires and not the No. 3 gage wires shall come in contact with the wall surface. The furring shall be set straight and true to the proper lines, and each No. 8 gage wire shall be secured to the wall at intervals not exceeding 18 inches by means of staples or anchor nails of improved type.

Steel Shapes

As an alternate method of construction, walls of brick, masonry or concrete may be furred with vertical furring bars consisting of 1 x ⅜ x ⅛ inch channels, or 1 x 1 x ⅛ inch angles, or other approved shapes of equivalent size and strength. These vertical furring members must be set plumb and true to the proper lines and must be securely bolted or anchored top and bottom to the ceiling and floor construction by bent knees, slotted clips or runner plates of approved type.

Runner Plates

Where runner plates are used, they shall be not less than 1 x ⅛ inch flat steel, or 1 x 1 x ⅛ inch angles, but must in any case be of such size and width as to properly receive and hold the furring and provide rigid and secure supports for same. Runner plates must be securely clamped or fastened to the floor beams by suitable attachments or must be securely connected to floor and ceiling construction by means of expansion bolts or anchor nails of approved type.

Intermediate Supports

In addition to being securely connected top and bottom to the ceiling and floor construction, all vertical furring members shall be securely fastened to the wall at intervals not exceeding 5 feet vertically by means of angle lugs or other suitable attachments properly bolted to the furring with ¼ inch diameter bolts, and securely connected to the wall with expansion bolts or anchor nails of approved type.

The spacing of furring bars shall depend upon the type of lath used, but in no case shall the spacing be more than 16 inches when plain lath is used, nor more than 18 inches when the lath is provided with V-stiffeners.

Application of Lath

After all furring has been set plumb and true to the proper lines, and all parts have been erected and assembled in a rigid and secure manner, the furring shall be covered with wire lath which shall be stretched smooth and true to the proper lines and securely wired in place as hereinbefore specified.

Plain lath shall be tied or laced to each furring bar at least every 6 inches vertically, and lath provided with V-stiffeners shall have each stiffener tied or laced to each furring bar. At lapped joints between furring bars similar ties shall be provided.

Chases, Air Ducts, Etc.

All pipe chases, air ducts and other spaces as may be required, and all surfaces of iron or steel coming within spaces to be plastered, shall be properly furred and lathed.

Without Furring

All such openings or spaces which do not exceed 2 feet in width may be lathed by the direct application of Clinton V-Stiffened Wire Lath without the use of any furring. In such cases the lath shall be applied in such a way that the V-stiffening ribs span across the space or opening with sufficient lap on either side and with each stiffener secured on each side with staples or anchor nails of approved type.

With Furring

Openings not less than 2 feet nor more than 4 feet in width shall have a 1 x 1 x ⅛-inch angle, set along each side with the outstanding leg flush with the wall surface and the other leg secured to the wall with expansion bolts or anchor nails of approved type. Extending across the opening and bolted with ¼-inch diameter bolts to the outstanding leg of each angle stud there shall be provided furring strips which shall not be less than 1 x 3/16-inch flat steel, but which, in any case, must have such stiffness and rigidity as to offer adequate support to the lath and plaster.

The vertical spacing of these furring strips shall depend upon the type of lath used, but shall not in any case be more than 16 inches if plain lath is used, nor more than 18 inches if the lath is provided with V-stiffeners.

After this furring has been set plumb and true to the proper lines, and all parts have been erected and assembled in a rigid and secure manner, the face of the framework shall be cov-

ered with wire lath which shall be stretched smooth and true to the proper lines and shall be securely wired in place as hereinbefore specified.

Plain lath shall be tied or laced to each furring strip at intervals of at least 6 inches and lath provided with V-stiffeners shall have each stiffener tied or laced to each furring strip. The lath shall lap the wall surface at least 4 inches on each side of the opening and shall be properly secured thereto by galvanized staples or anchor nails of approved type.

Openings exceeding 4 feet in width shall be properly furred in such a way as to give adequate support to the lath and prevent any tendency to bulge or bag and with such degree of detail and exactness as will meet the approval of the architect.

Lath Adjoining Masonry

All lath shall be lapped at least 4 inches over all adjoining masonry and shall be properly secured thereto by galvanized staples or anchor nails of approved type.

Joints

Where materials of a different kind come together, such as the joining of brick to gypsum or gypsum to terra cotta, etc., such joints shall be covered with a strip of Clinton Wire Lath which shall extend 6 inches on each side of the joint and which shall be properly secured in place by galvanized staples or anchor nails of approved type.

Miscellaneous

It is to be understood that all miscellaneous furring and lathing as indicated on the plans, but which may not herein be specifically described, shall be done in a workmanlike manner conforming in all respects with the general scope and intent of these specifications and in such degree of detail and exactness as will meet the approval of the architect.

Specifications for Interior Plastering

General Requirements

Intent It is the intent of this specification to include the furnishing of all labor, materials, apparatus, ladders, scaffolding, hoisting and cartage necessary to supply, mix, install and complete all plain and ornamental plastering as called for on the plans or as designated by the architect.

Storing and Handling Materials All plaster, lime and cement when delivered to the work shall be properly protected and shall not be placed on the ground, against damp walls or in any unventilated place.

In no case shall mortar be mixed on bare ground and when mixed in wooden boxes they shall be absolutely water tight.

When plastering is being done the building shall be properly enclosed against the weather and shall be otherwise kept in suitable working condition. In extreme warm weather proper precaution must be taken to prevent fresh plaster from drying out too rapidly, and in extreme cold weather precaution must be taken to prevent plaster from freezing.

Plastering in General All plaster work of whatever kind or description shall be done with such materials and with such appliances as will meet the approval of the architect, and all labor in connection therewith shall be performed by skilled and experienced workmen in accordance with the best practice and requirements of the trade.

All plastering in which fire cracks, pits, checks, waves, laps, streaks, cat-faces, popping, blistering, discolorations or other defects may occur will be considered as inferior and will not be accepted.

Materials

Lump Lime Lime used for plastering shall be the best quality, evenly and thoroughly burned limestone. It shall be free from clinkers and shall contain not more than 15 per cent of impurities. It shall slack readily in water, forming a fine smooth paste without residue in excess of 15 per cent.

Hydrated Lime Hydrated limes of approved brands may be used in place of lump lime. All hydrated lime must be delivered to the work in original packages and shall be mixed in strict accordance with the manufacturer's specifications.

Prepared Plasters

All patented or prepared plasters and all Keene cements shall be of approved brands and shall be received at the building operations in original packages. They shall be mixed and applied in strict accordance with the manufacturer's specifications, and in all cases where such patented or prepared plasters may be used those specifications shall become a part of and be included in the general scope and intent of this specification.

Portland Cement

All cement used for gaging lime mortars or for preparing cement mortars as hereinafter specified shall be a high-grade, well-seasoned Portland cement of such composition and quality as will meet the requirements of the American Society for Testing Materials.

Sand

All sand shall be free from loam, salt or other impurities and shall be of angular grains, sharp, clean and properly screened.

Binder

The binder shall be water soaked, well beaten, clean, long winter hair or approved vegetable fiber cut in 2 to 3 inch length.

Water

All water used for mixing mortars and plasters shall be clean and free from alkali, salt and other impurities.

Water used in mixing mortars and plasters shall be used for no other purpose, and separate receptacles shall be provided to contain water used for cleaning and washing tools.

Lime Mortars

Scratch Coat

The mortar for the scratch coat shall be mixed in the proportions of 1 barrel of lump lime to 2½ barrels of clean, sharp sand and binder, in the proportion of 2 pounds of hair or 3 pounds of fiber to 100 pounds of lump lime. Or the mix may be proportioned as follows: to 1,000 pounds of unslacked lime add 1 cubic yard of clean, sharp sand and 10 pounds of hair or 15 pounds of fiber.

The lime shall be thoroughly slacked and the putty shall be allowed to cool before incorporating the hair, in order to avoid burning. The proper amount of sand shall then be thoroughly mixed in and the mortar banked for at least three days.

Brown Coat

The mortar for the brown coat shall be composed of 1 barrel of lump lime to 5 barrels of clean, sharp sand, with binder in the proportion of 1 pound of hair or fiber to 100 pounds of

lump lime. Or the mix may be proportioned as follows: to 500 pounds of unslacked lime add 1 cubic yard of clean, sharp sand and 2½ pounds of hair or fiber.

The mortar for the brown coat shall be prepared as for the scratch coat and banked for at least three days before using.

Gaging All lime mortar for both the scratch and the brown coats shall be gaged with Portland cement, in the proportions of 1 part of cement to 10 parts of mortar.

All mortar shall be gaged in such quantities as will permit of convenient and prompt application, and no gaged mortar shall be applied after a time limit of one hour subsequent to the addition of the cement.

Finish Coat The finish coat shall consist of white mortar gaged with plaster of Paris, the white mortar consisting of a well-slacked lime putty, with marble dust or white sand in combination.

In preparing the white mortar, the lime shall be thoroughly slacked in a box, mixing in a small proportion of white sand or marble dust. It shall then be run through a No. 10 mesh wire sieve into a storage box and allowed to stand for at least forty-eight hours before gaging with the plaster. The finish coat shall be mixed in the proportions of 1 part of plaster of Paris to 2 parts of white mortar. The mortar and plaster shall be mixed only in such quantities as will admit of convenient handling, and after gaging with the plaster the finish coat shall be promptly applied.

Patented or Prepared Plasters

Notification Instead of the lime mortars as herewith specified, the contractor may use patented or prepared plasters of standard recognized quality, but in case of such substitution the contractor shall duly notify the architect in writing as to the particular brand intended for use.

Approval of Brand The architect may, at his discretion, accept or reject any brand of prepared plaster thus submitted for his consideration. After approval of any particular brand, that brand, and none other, shall be used, and all such plaster shall be received at the building operations in original packages and shall be mixed and applied in strict accordance with the manufacturer's specifications.

Plain Plastering

Number of Coats

All plain plastering on wire lath shall be three-coat work,— scratch coat, brown coat and finish coat. No "laid-on" work will be permitted, but each coat must be thoroughly dry or set before the next coat is applied.

Applying the Scratch Coat

The scratch coat, which shall not be less than ¼ inch thick, shall be well keyed into the lath and shall be applied with such force as to secure a perfect clinch. The scratch coat while wet shall be thoroughly scored or scratched with diagonal lines nearly through its thickness.

Applying the Brown Coat

After the scratch coat has become dry, screeds accurately run with straight edges to form true plane surfaces shall then be set around all margins and at 5-foot intervals. In applying the brown coat the areas between screeds shall be filled flush with the screeds and floated carefully to a true plane, finishing straight and true to a continuous even surface within ⅛ inch of the finished plaster face.

Applying the Finish Coat

The finish coat must be evenly applied and shall be properly troweled to a perfectly true, smooth and hard surface, having an egg-shell gloss of even color without stain, mark or defect of any kind. Where sand finish is called for it shall be applied before the brown coat is quite dry, or, if dry, the brown coat shall be wet down and the sand coat troweled or floated to the desired finish.

Workmanship

All surfaces shall be straight edged in every direction, walls plumb, ceilings level and all jams and angles straight, true and perfect. All exterior vertical and horizontal angles unless set with corner beads shall be bull nosed to ½ inch radius with stop above the base line and at other points as directed, and all interior angles shall be finished clean, straight and true.

Ornamental Plastering

Models

Models made by experienced modelers shall be prepared and furnished as may be required by the architect for all molded or ornamental plaster work. All models shall conform in size and detail with the approved drawings and shall in each case include a proper and sufficient section of the feature of which the model or sections form a part.

Paneled Ceilings

Ceiling beams shall be formed where indicated or specified with true, straight arrises and surfaces and with sharp, exact angles. Ceiling panels shall be formed where indicated or specified with moldings and sinkages in accordance with the detailed drawings. They shall be accurately centered and spaced and all miters and moldings shall be accurately lined and formed in a workmanlike manner.

Cornices

Cornices shall be run where indicated or specified, accurately reproducing the profiles as indicated on the detailed drawings with ornaments as shown and with all angles and intersections accurately and correctly made.

Enrichments, etc.

All moldings, enrichments, panels, brackets, etc., shall be sharp, crisp, hard and perfectly formed. All moldings shall be run with accurate metal forms, faithfully reproducing the profiles as shown on detailed drawings and shall be made with clean, sharp, accurate angles, intersections and miters.

All ornaments shall be cast in new clean cut molds, accurately reproducing the models, and the castings shall be clean and sharp, with full relief and under cut work where shown or required.

All ornament shall be accurately centered and spaced and shall be fixed and placed in position with absolute security. All ornament erected in sections shall be carefully and accurately connected and all trimming, filling and washing shall be done in a neat and workmanlike manner.

Molds

All molds which may through usage or accident become clogged, dented, deformed or otherwise rendered unfit for use shall be discarded and new molds shall be provided as often as is necessary to secure exact and perfect castings in every case.

Preparation for Tiling

Cement Mortar

Where walls in bath-rooms, lavatories and other places are furred and lathed to receive tile, the mortar shall be composed of 1 part Portland cement, 3 parts of clean, sharp sand and 10 per cent of lime putty or hydrated lime with sufficient hair or fiber binder.

Application of Mortar

This mortar shall be applied with sufficient force to establish a perfect key into the lath and shall be properly scored or

scratched with diagonal lines to receive the tile. This preparatory surface shall be run true and fair to the proper lines and shall finish at the proper level to receive the tile and bedding for same so that the tile will finish with proper off-set from the plastered walls above.

Plastering on Concrete, Brick and Masonry

Number of Coats

All plastering on brick, masonry or concrete shall be two-coat work, being done only in the brown and finishing coats and shall finish at least ½ inch thick.

Concrete Surfaces

When plastering is applied to concrete surfaces the surface shall be clean, free from oil and properly prepared for binding and keying the plaster. If it is not practical to put the concrete surface in proper condition to receive the plaster, the work shall be properly furred and lathed and plaster applied in accordance with the specifications for three-coat work.

Brick Surface

When plastering is applied to brickwork or masonry the surfaces must be thoroughly clean and the joints left rough or open before the plastering is applied. Any slight irregularities in the surface shall be taken care of in the brown coat; but in the case of serious irregularities the surface shall be properly furred and lathed and plaster applied in accordance with the specifications for three-coat work.

Stucco or Exterior Plastering

Stucco Houses

Cement is now being extensively used in the construction of exterior walls for residences, barns, garages and many other types of small buildings. In this use of cement two principal types of construction have been developed, namely, the concrete house and the stucco house. By the term "stucco" is understood the exterior finish of cement or cement-lime plaster which may be applied as an exterior covering to a framework of wood or steel or walls of brick or terra cotta. In this way stucco construction is distinguished from the true concrete house, although both may present similar exterior appearances. The growing popularity of stucco construction is shown in the great number of residences which are to-day being built of this construction. Being susceptible of almost any desired tint and surface finish, stucco lends itself to a variety of uses and gives the architect unlimited scope in developing almost any degree of artistic embellishment.

The layman is very apt to be skeptical of stucco houses, especially if he has seen some which have cracked, spotted or otherwise become disfigured, and may thus have the impression that the stucco house is frail and unstable. While it must be admitted that the stucco house as sometimes built offers a very poor example of the builder's art, it cannot be denied that good stucco construction, in which the best materials are used and the work executed in a proper and careful manner, is durable and lasting and affords an ideal method of building artistic and economical residences and small buildings of all kinds.

Stucco houses in order to be durable must be built with great care and must involve the use of the very best materials obtainable. The permanency of stucco construction is dependent absolutely upon a selection of proper materials and a strict adherence to certain essential principles of design and construction. Unless the supporting framework is rigid and well made, unless the materials entering into the construction are of the very best, unless these materials are mixed and applied with unusual care, stucco

Stucco on Clinton Wire Lath

A House at Chestnut Hill, Mass. Chapman & Frazer, Architects

finish will invariably crack, flake off, become spotted or deteriorate in some way or another in a comparatively short time. If, on the other hand, the construction is good, stucco may be depended upon as an economical, artistic and permanent form of construction thoroughly adapted to all grades of houses and small buildings, from the simplest little garage to the most elaborate and costly residence.

The Lath

In stucco construction the stucco finish is exterior plaster and is consequently subjected to severe climatic conditions of heat, cold and moisture, which tend to disintegrate it and dislodge it from its support. For this reason it is essential that the grade and quality of the lathing material be such that it will provide a most secure

and efficient foundation to support and hold the plaster in place. The lath must therefore be a material which will establish a perfect key for the plaster; it must be thoroughly embedded in the body of the plaster in order that the reinforcing action of the metal may be perfect; and it must be a material which will not rust away under the action of the elements. The designer or builder of stucco work must not think, because the lath is covered up and hidden from view, that any old thing will do. The greatest care in plastering, troweling and finishing cannot prevent or eliminate defects which are bound to result from an improper foundation, and for this reason the grade and quality of the lathing material is of vital importance to the success of stucco construction.

Our galvanized wire lath, as described in the foregoing pages, possesses the essential structural features required for stucco construction and, as it has been successfully used in this kind of work

Stucco on Clinton Wire Lath

A House at New Orleans, La. R. Spencer Soule, Architect

for many years, has everything to commend it as the ideal lathing material for supporting exterior plaster. For stucco work we especially recommend our No. 19 and No. 20 galvanized-after-woven lath both in the plain and in the V-stiffened grades.

Wall Construction

Of the various methods of building stucco walls, a very common and satisfactory form of construction is one in which the supporting framework consists of a rigid timber or steel construction with the very best grade of galvanized wire lath supporting the stucco covering. For residences and smaller buildings the frame-

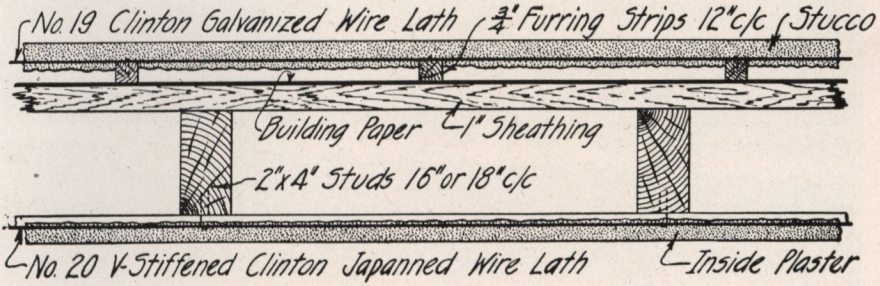


Fig. 28. Section of Stucco Wall with Sheathing

work is usually built of wood, consisting of studs either with or without sheathing. In this form of construction it is important that the studding be well braced, and if sheathing is used that it be securely nailed in place, with all joints properly arranged so that the building may be as stiff and rigid as possible.

If the frame be constructed with sheathing, this should be covered with the best grade of waterproof paper, which should be carefully lapped and sealed in order to be thoroughly moisture-proof. There should then be applied the very best grade of galvanized wire lath that it is possible to obtain. This should be properly furred out beyond the sheathing in order to obtain the proper key, and also to provide an air space behind the plaster, and should be tightly stretched and securely fastened in place in order to prevent bulging of the lath and subsequent cracking of the plaster.

Another and very efficient type of wall construction is one in which the sheathing is omitted. This is accomplished by applying the wire lath, which for this type should always be provided with V-stiffeners, directly to the outside of the studs with the V-stiffeners running transversely to the studs and stapled to them. After the mortar of the first coat is applied to the exterior and has become set, the inside or the back face of this coat is then plastered over with ½ to 1 inch of mortar, which is beveled or rounded in against the studs. In this way the wooden sheathing is replaced in reality by cement sheathing, which is locked against the studs by these beveled ridges of plaster, thereby stiffening and bracing the studding and serving every function of sheathing.

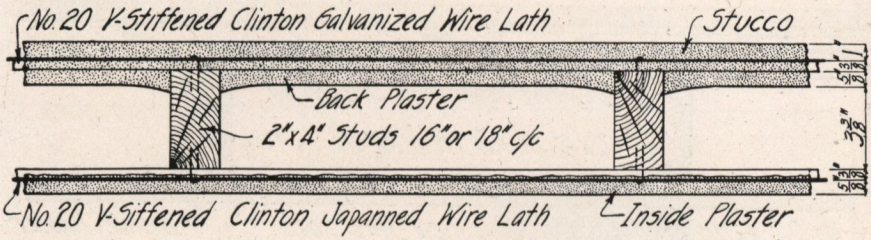


Fig. 29. Section of Stucco Wall without Sheathing

This type of construction is a very satisfactory one and forms a very rigid and secure wall.

In the type of construction involving the use of sheathing it is important to have the lath properly furred away from the surface, in order that proper key may be established with the plaster and that air space may be obtained between the plaster and the sheathing. This may be accomplished by setting ¾ inch furring strips at 12 inch intervals if plain lath is used, or at 18 inch intervals if the lath is provided with V-stiffeners. Furring strips, however, may be eliminated entirely by using Clinton Lath, provided with V-stiffeners of proper size to give the required offset. The standard V-stiffener which is ⅜ inch deep is hardly sufficient for this purpose and, for that reason, lath to be used over sheathing without furring should be provided with special stiffeners having the required depth. By providing the lath with

Stucco on Clinton Wire Lath
A House at Brookline, Mass. Chapman & Frazer, Architects

stiffeners ¾ inch deep this material may be applied directly to the sheathing, eliminating all furring strips and giving ample clearance behind the face of the lath to establish a satisfactory key.

When the sheathing is omitted and the lath applied directly to the studs, or when applied to furring strips on sheathing, it is never necessary to make use of special stiffeners, since the standard V-stiffeners as attached to stock grades of Clinton V-Stiffened Lath are of sufficient size to give ample stiffness and rigidity to the lath.

The Stucco

The exterior plaster or stucco is usually applied in three coats, which should finish not less than 1 inch thick. In constructing a stucco wall without sheathing, however, the exterior plaster face,

including its coat of back plaster, should finish not less than 1½ inches or preferably 2 inches thick. The total thickness of exterior plaster, however, should in no case be less than 1 inch, as it is impossible to make a thinner wall waterproof, and thorough water tightness is absolutely essential to the ultimate appearance of the stucco finish.

Care should always be exercised in selecting the sand for stucco to make sure that it is entirely free from loam or organic matter, as a dirty sand will prevent the proper setting of the cement. Lime or plaster of Paris should never be used for exterior plastering, as it is not durable and is apt to disintegrate under the action of the weather. A small amount of lime putty, however, may be used together with the Portland cement.

The first or scratch coat is usually mixed in the proportions of 1 part Portland cement to 2½ parts of clean, coarse sand, with the

Stucco on Clinton Wire Lath

A House at York Harbor, Me. James Purdon, Architect

addition of from 10 to 15 per cent of well-seasoned lime putty to facilitate working. Hair binder is sometimes added to the scratch coat in the proportions of 2 pounds of hair to 1 barrel of cement.

The second or brown coat is usually of the same mixture as the scratch coat, except that no hair binder is used in this coat. Before applying the brown coat the scratch coat should be thoroughly dampened.

The finishing coat is usually a mixture of cement or hydraulic lime and marble dust or cracked silicate and is usually mixed in the proportions of 1 part of hydraulic lime to 2 or 3 parts of marble dust or silicate.

Surface Finish

Various degrees of roughness in the surface finish of the final coat may be developed, ranging from the smooth trowel finish to the rough cast, spatter dash or pebble dash finish. The rough surfaces, however, are always to be preferred, as they are not apt to show the fine checks or hair cracks which are liable to occur in work of this kind.

The smooth finish is obtained in the usual manner of floating to an even surface and troweling to a smooth finish, while the rough cast or rough suction finish is obtained by floating and drawing the surface rough.

The rough cast finish may be obtained by using trowels covered with carpet or burlap. It is not well to trowel the surface too much, however, as the plaster is liable to crack and fall off if the cement is disturbed after it has begun to set. To obtain the best results, the rough cast surface should really be what is sometimes called sand finish. This is done by using a slight excess of sand and having the plaster not very wet. The sand should be large grained and coarse, as this will add to the rough appearance of the surface.

The slap dash or spatter dash finish when performed by experienced workmen is probably the most universally used of any of the various finishes. The slap dash is secured by throwing a creamy mixture of cement and sand against the wall by dashing

from a wooden paddle in such a way as to produce a roughened surface. A similar surface, although somewhat finer in texture, may be obtained by dashing from a stiff broom.

The pebble dash surface can be secured by applying the final coat fairly wet and then throwing clean pebbles into the fresh plaster. The pebbles must, of course, be distributed uniformly over the surface, and must be thrown against the fresh soft plaster with sufficient force to embed themselves securely. Pebble dash finish is sometimes obtained by mixing small pebbles with a creamy mixture of cement and sand and applying like the slap dash.

Colored Stucco

The finish coat when desired may be colored by mixing in various coloring materials. In order to assure homogeneous tints, and especially tints that will match from day to day as the work progresses, the coloring material should always be added to the dry materials of the mortar and thoroughly mixed with them before water is added. They should always be carefully proportioned in exact amounts, and these amounts should not be changed or varied. Unless the builder is thoroughly familiar with dry coloring materials and has had considerable experience in the use of them, it is usually advisable when colored work is desired to use some of the prepared color stuccos. There are a number of these on the market and some of them have proved very satisfactory.

Coloring is sometimes obtained by mixing screenings of colored marble in the finish coat. These marble screenings may be green, red, buff, black or white and, by cutting or scrubbing the surface with acid after it has hardened, thereby exposing the colored screenings, some very pleasing color effects may be obtained.

The following table taken from *Cement and Concrete*, by Louis C. Sabin, indicates the various tints given to Portland cement mortars by the addition of various dry coloring materials.

Colored Mortars

Colors Given to Portland Cement Mortars Containing 2 Parts River Sand to 1 Cement

Dry Material Used	Weight of Dry Coloring Matter to 100 Pounds of Cement			
	½ Pound	1 Pound	2 Pounds	4 Pounds
Lamp Black	Light Slate	Light Gray	Blue Gray	Dark Blue Slate
Prussian Blue	Light Green Slate	Light Blue Slate	Blue Slate	Bright Blue Slate
Ultra Marine Blue	.....	Light Blue Slate	Blue Slate	Bright Blue Slate
Yellow Ochre	Light Green	.....	.....	Light Buff
Burnt Umber	Light Pinkish Slate	Pinkish Slate	Dull Lavender Pink	Chocolate
Venetian Red	Slate, Pink Tinge	Bright Pinkish Slate	Light Dull Pink	Dull Pink
Chattanooga Iron Ore	Light Pinkish Slate	Dull Pink	Light Terra Cotta	Dull Brick Red
Red Iron Ore	Pinkish Slate	Dull Pink	Terra Cotta	Light Brick Red

From *Cement and Concrete*, Louis Carlton Sabin; McGraw Publishing Co., N. Y.

Lathing Specifications for Exterior Stucco

General Requirements

Intent It is the intent of this specification to include the furnishing of all labor, materials, apparatus, ladders, scaffolding, hoisting and cartage necessary to supply, erect and complete all waterproofing, furring and lathing required to construct a substantial and proper foundation for exterior plastering.

Wire Lath The lath throughout shall consist of Clinton Wire Lath woven with 2½ meshes per lineal inch and of size and type as hereinafter specified.

Galvanizing All lath used for supporting exterior plaster shall be thoroughly galvanized after woven, and no type of painted or dipped lath other than that which is galvanized will be accepted when used to support exterior plaster.

Laps All lath shall be lapped at least 1 inch where end joints are made and these joints shall be properly alternated or broken. Side joints shall be properly lapped and stapled in such a manner as to provide secure and unbroken continuity to the lathed surface.

Staples All lath applied to wooden supports shall be properly secured thereto with Clinton Galvanized Wire Staples as hereinafter specified.

Workmanship All lath shall be tightly drawn with proper tools and rigidly secured to all bearings. It shall finish fair and true to the required lines without bag, bulge or sag, being straight and smooth over all flat surfaces and properly bent for all molded and curved work.

All lath shall be properly secured in place before plastering is begun and all necessary supports, connections and attachments shall be supplied and erected as required, leaving all surfaces in proper condition to receive the plaster.

All waterproofing, furring and lathing of whatever kind or description shall be done with such materials and be of such arrangement and design as will meet the approval of the architect, and all labor in connection therewith shall be performed by skilled and experienced workmen in accordance with the best practice and requirements of the trade.

Walls with Wooden Sheathing

Waterproofing

Where the wall framing is constructed with wooden sheathing, the exterior surface of the sheathing shall be waterproofed with an approved quality of 3-ply waterproof building paper of such thickness that 8 square feet will weigh 1 pound.

This paper shall be laid in horizontal strips, beginning at the bottom of the wall with the first or bottom strip overlapping the base-board. Each layer of paper shall be secured to the sheathing with tacks provided with washers, and all tacking shall be done within 2 inches of the top horizontal edge of each strip. The lower horizontal edge of each strip shall lap the top edge of the one below at least 2 inches and shall be cemented thereto with approved liquid tar or asphalt compound.

Strips of the same paper as herewith specified shall extend around all openings and shall lap the flashings and be securely cemented thereto with approved liquid tar or asphalt.

Furring Strips

After the sheathing is thoroughly waterproofed as hereinbefore specified, ¾-inch wooden furring strips shall be set vertically at 12-inch intervals. These furring strips shall be securely nailed in place and leveled and plumbed in such a way as to provide a proper and secure foundation to receive the lath.

Wire Lath

Over the furring there shall then be applied No. 19 gage Clinton Galvanized Wire Lath.

Application of Lath

The lath shall be tightly drawn and lapped as hereinbefore specified and shall be securely stapled at 6-inch intervals along each furring strip with ¾-inch No. 14 round top Clinton Galvanized Wire Staples.

Special Stiffened Lath without Wooden Furring

Wooden furring strips as hereinbefore specified may be omitted by using Clinton Wire Lath, provided with special ¾-inch V-stiffeners. The lath for this purpose shall be No. 20 Clinton Galvanized Wire Lath provided with special V-stiffening ribs, the depth of which shall be not less than ¾ inch beyond the face of the lath. These V-shaped ribs shall be securely clamped to the transverse wires and shall extend across the full width of the fabric at intervals not exceeding 8 inches.

Application of Special Stiffened Lath

The special stiffened lath as hereinbefore specified shall be applied directly to the waterproofed surface with the apex of each stiffener coming in direct contact therewith and being securely connected thereto with special 1½-inch No. 12 square top Clinton Galvanized Wire Staples.

The lath shall be tightly drawn and lapped as hereinbefore specified and shall have each stiffener secured at each end and at its center by staples as specified, which shall span the stiffener and be driven to a secure bearing into the wooden sheathing behind same.

Walls without Sheathing

Waterproofing

Where the wall framing consists of wooden studs without sheathing, the exterior face of each stud and the sides of each stud to a depth of not less than 1 inch, or to such depth as may come in contact with the plaster, shall be waterproofed by thoroughly painting with approved liquid tar or asphalt compound.

Wire Lath

After the studs have been properly waterproofed they shall be covered with No. 20 gage Clinton Galvanized Wire Lath, provided with standard V-stiffening ribs, the depth of which shall be not less than ⅜ inch beyond the face of the lath. These ribs shall be securely clamped to the transverse wires and shall extend across the full width of the fabric at intervals not exceeding 8 inches.

Application of Lath

The standard V-stiffened lath as hereinbefore specified shall be applied directly to the exterior faces of the studs with the apex of each stiffener coming in direct contact therewith and with the stiffening ribs spanning across the space or opening between studs.

The lath shall be tightly drawn and lapped as hereinbefore specified, and each stiffener shall be secured to each stud with 1¼-inch No. 13 square top Clinton Galvanized Wire Staples, which shall span the stiffener and be driven to a secure bearing into the wooden studs behind same.

NOTE. The inside walls and ceilings of stucco houses with wooden framing should be lathed by applying No. 20 V-Stiffened Clinton Japanned Wire Lath directly to the wall studs and floor joists. The lath should be properly lapped and stapled in accordance with the above specification.

Plastering Specifications for Exterior Stucco

General Requirements

Intent

It is the intent of this specification to include the furnishing of all labor, materials, apparatus, ladders, scaffolding, hoisting and cartage necessary to supply, mix, install and complete all plastering and all stucco finish as called for on the plans or as designated by the architect.

Storing and Handling Materials

All lime, cement, coloring matter, waterproofing compound or other materials to be used in the preparation of plaster or stucco finish shall be properly protected when delivered to the work and shall not be placed on the ground against damp walls or in any unventilated place. In no case shall mortar be mixed on bare ground and when mixed in wooden boxes they shall be absolutely water-tight.

While plastering is being done and for such a period subsequent thereto as may be required to insure satisfactory work, all plaster surfaces shall be properly protected against the weather. In rainy or threatening weather all fresh surfaces must be properly protected against the direct washing effect of the rain. No fresh plaster shall be permitted to dry out rapidly, and adequate precaution shall be taken to protect it from the rays of the sun either by sprinkling after the mortar has set hard enough to permit it or by hanging wet burlap or other material over the plastered surface.

Plastering in General

All plaster work of whatever kind or description shall be done with such materials and with such appliances as will meet the approval of the architect, and all labor in connection therewith shall be performed by skilled and experienced workmen in accordance with the best practice and requirements of the trade.

All plastering in which cracks, pits, streaks, discolorations or other defects may occur will be considered as inferior and will not be accepted.

Materials

Lump Lime

The lime shall be the best quality — evenly and thoroughly burned limestone. It shall be free from clinkers and shall

contain not more than 15 per cent of impurities. It shall slack readily in water, forming a fine smooth paste without residue in excess of 15 per cent.

Hydrated Lime Hydrated limes of approved brands may be used in place of lump lime. All hydrated lime must be delivered to the work in original packages and shall be mixed in strict accordance with the manufacturer's specifications.

Portland Cement The cement shall be a high-grade, well-seasoned Portland cement of such composition and quality as will meet the requirements of the American Society for Testing Materials.

Plaster of Paris The use of plaster of Paris in connection with exterior plastering is positively forbidden and any work containing same will be immediately rejected.

Sand All sand shall be free from loam, salt or other impurities and shall be of angular grains, sharp, clean and properly screened.

Coloring Matter Mineral colors only shall be used in coloring exterior plaster, and the use of no coloring matter which is affected by lime or Portland cement, or which is not lasting under the action of the elements, will be permitted.

Waterproofing Compounds In case a special waterproofing is to be added to mortar for stucco work, it shall be done only with the approval of the architect. Such waterproofing shall be delivered to the work in original packages and applied in strict accordance with the manufacturer's specifications.

Water All water used for mixing mortars and plasters shall be clean and free from alkali, salt and other impurities.

Water used in mixing mortars shall be used only for that purpose and separate receptacles shall be provided to contain the water for cleaning and washing tools.

Preparation of Mortars

Mixing All mixing shall be done on a water-tight platform and the ingredients of the mortar shall be turned until they are thoroughly mixed to a uniform color. After dry materials are thoroughly mixed, sufficient water shall be added to obtain the desired consistency, and the mixing shall continue

until the mass is uniform in color and homogeneous in appearance.

Re-tempering

Mortar shall be mixed only in such quantities as will permit of convenient and prompt application, and no mortar shall be applied after a time limit of one hour subsequent to the addition of the water. Any batch of mortar which may become partially set before application shall be discarded as the retempering of mortar is positively forbidden.

First Coat

Mortar for the first coat shall be mixed in the proportions of 1 part of Portland cement to 2½ parts of sand, the parts being measured by volume. A small amount of well-seasoned lime putty may be added to facilitate working, but lime putty shall not be added in excess of 15 per cent of the volume of cement.

Second Coat

The mortar for the second coat shall be mixed as specified for the first coat.

Finish Coat

The mortar for the finish coat shall be mixed in the proportions of 1 part of cement to not less than 2 nor more than 3 parts of sand by volume. Well-seasoned lime putty may be added to facilitate working, but the amount of putty shall not exceed 15 per cent of the volume of cement.

Colored Mixtures

The final coat may be colored by the addition of mineral coloring matter in such proportions as may be found to produce the desired color effect, but no coloring matter shall be added in excess of 6 per cent of the weight of the Portland cement.

In coloring the finish coat the proper amount of finely ground coloring matter shall be carefully weighed or measured and thoroughly mixed with the sand before the cement is added. The cement and lime shall then be added and the entire mass thoroughly mixed by shoveling from one side of the mixing board to the other through a ¼-inch wire mesh screen. This process shall continue until the batch is of uniform color when sufficient water shall be added then to produce the proper consistency.

Application of Mortars

Number of Coats

Exterior plastering shall be done in three coats, — first coat, second coat and finish coat.

First Coat The lathing and walls shall first be thoroughly dampened and a heavy coat of mortar applied with sufficient force to secure a perfect key into the lath. The first coat shall have a thickness of not less than ⅜ inch over the face of the lath and while wet shall be thoroughly scored or scratched with diagonal lines to present a roughened surface to receive the second coat.

Second Coat After the first coat has become dry, screeds accurately run with straight edges to form true plane surfaces shall then be set around all margins and at 5-foot intervals. The surface of the first coat shall then be thoroughly dampened and the second coat applied flush with the screeds and floated carefully to a true plane, finishing straight and true to a continuous even surface and of thickness which shall not be less than ⅜ inch.

Back Plaster In case the wall is to be constructed without sheathing, the inside face of the lath shall be back-plastered after the first exterior coat has been applied and has become set. This back-plaster shall be applied to a thickness of at least ½ inch beyond the innermost metal of the lath and shall be carefully troweled to a smooth surface and curved or beveled back against the studs.

Thickness of Plaster No exterior stucco plaster shall finish less than 1 inch in thickness when sheathing is used, nor shall the total thickness of exterior plaster be less than 2 inches when sheathing is omitted.

Finish Coat Before applying the finish coat the surface shall be thoroughly dampened in order to prevent absorption of moisture from the fresh mortar and the finish coat then applied to a thickness which shall not be less than ¼ inch.

The final coat shall be applied in such a way and with such materials as will produce the desired finish and the work shall be done as hereinafter specified under "Stucco Finish," the particular paragraph or section applying hereto being determined by the type or character of finish as designated by the architect.

Stucco Finish

Smooth Troweled The finishing coat shall be floated to a true surface and troweled smooth with a metal trowel, using as little rubbing as possible.

Stippled

The finishing coat shall be troweled smooth with a metal trowel and shall then be lightly patted with a brush of broom straw to produce an even stippled surface.

Sand Floated

The finishing coat, after being brought to a smooth even surface, shall be rubbed with a circular motion of a wooden float. This floating shall be done when the mortar has partially set and a little sand shall be used to slightly roughen the surface.

Slap Dash

After the finishing coat has been brought to a smooth even surface and before attaining final set, it shall be uniformly coated with a mixture of 1 part of cement to 2 parts of sand thrown against the wall with considerable force by dashing from a wooden paddle in such a way as to produce a roughened surface of uniform texture. Lighter shades may be obtained in this finish by adding hydrated lime in the proportion of 10 to 15 per cent of the volume of the cement.

Broom Dash

After the finishing coat has been brought to an even surface it shall be spattered with a creamy mixture of equal parts of cement and sand mixed fresh every thirty minutes and kept well stirred in a bucket. This coating shall be applied with considerable force and shall be thrown against the surface by dashing the liquid from the bristles of the broom. This coating shall be applied while the finishing coat is still moist and before it has attained its final set. Lighter shades may be obtained in this finish by adding hydrated lime in the proportion of 10 to 15 per cent of the volume of the cement.

Pebble Dash

After the finishing coat has been brought to a smooth even surface and before attaining final set, it shall be uniformly coated with a mixture of 1 part of cement to 2 parts of sand to which has been added a small quantity of clean round pebbles or other material as selected not smaller than ⅛ inch nor larger than ¼ inch. This mixture shall be thrown against the wall with considerable force by dashing from a wooden paddle. The object of this finish is to obtain, through the use of the pebbles, a roughened surface of coarser texture than that obtained by the ordinary slap dash finish. Lighter shades may be obtained in this finish by adding hydrated lime in the proportion of 10 to 15 per cent of the volume of the cement.

Pebble Cast

After the finishing coat has been brought to a smooth even surface and before attaining initial set, clean round pebbles or other material as selected, not smaller than ¼ inch or larger than ¾ inch, shall be thoroughly wetted and then thrown with considerable force against the wall so as to embed themselves in the fresh mortar. They shall be distributed uniformly over the surface of the final coat and may be pushed back into the mixture with a clean wood trowel, but no rubbing of the surface shall be done after the pebbles are embedded.

Exposed Aggregates

The finishing coat shall contain a predetermined amount of approved coarse aggregate, such as crushed granite, marble or other material as may be selected. It shall be floated and troweled to a smooth even surface and within 24 hours after being applied shall be scrubbed with a stiff broom and water. In case the cement has become too hard for this treatment, a solution of 1 part hydrochloric acid in 4 parts of water by volume may be used in place of the water. After the particles of aggregate have been uniformly exposed by scrubbing, care shall be taken to remove all traces of the acid by spraying the surface with a hose.

NOTE. The inside walls and ceilings of stucco houses should be plastered in accordance with the specifications for Interior Plastering, page 60.

Weights and Sizes of Steel Shapes

Tables 1 to 5 inclusive, showing the various sizes and corresponding weights of channels, angles and tees, have been compiled from the sections given in the Shape Book of the Carnegie Steel Company. These sections are all what are termed "Bar-Mill Sizes" and cover the small steel shapes commonly used in the construction of metal furring. Shapes larger than the ones tabulated herewith come under the head of "Structural Sizes" and may be found in any structural steel handbook.

In the following tables the average weight of steel has been taken as 489.6 lbs. per cubic foot, on the basis of which a bar of one square inch cross section and one foot long weighs 3.4 lbs. The area of any steel section in square inches, therefore, may be obtained by dividing the weight per lineal foot by 3.4.

TABLE 1

Steel Shapes (Bar Mill Sizes)

Channels

Section Index	Depth Inches	Flange Width Inches	Web Thickness Inches	Weight per Foot Pounds
C539	2½	¾	5/16	3.33
	2½	11/16	¼	2.80
	2½	⅝	3/16	2.27
C535	2	⅝	¼	2.32
	2	9/16	3/16	1.90
	2	½	⅛	1.47
C531	1¾	9/16	¼	1.92
	1¾	½	3/16	1.55
	1¾	7/16	⅛	1.18
C528	1½	⅝	¼	1.76
	1½	9/16	3/16	1.44
	1½	½	⅛	1.12
C525	1⅜	½	¼	1.49
	1⅜	7/16	3/16	1.20
	1⅜	⅜	⅛	0.91
C520	1¼	½	¼	1.39
	1¼	7/16	3/16	1.12
	1¼	⅜	⅛	0.85
C518	1⅛	½	¼	1.29
	1⅛	7/16	3/16	1.05
C513	1	½	¼	1.10
	1	7/16	3/16	0.89
	1	⅜	⅛	0.68
C508	⅞	7/16	3/16	0.84
	⅞	⅜	⅛	0.65
	⅞	23/64	7/64	0.61
C570	¾	5/16	⅛	0.50
	¾	19/64	7/64	0.46
C500	½	¼	⅛	0.28
	½	15/64	7/64	0.26

TABLE 2

Steel Shapes (Bar Mill Sizes). Equal-Leg Angles

Section Index	Size, Inches	Thickness, Inches	Weight per Foot Pounds
A41	2¾ x 2¾	½	8.5
A42	2¾ x 2¾	7/16	7.6
A43	2¾ x 2¾	⅜	6.6
A44	2¾ x 2¾	5/16	5.6
A45	2¾ x 2¾	¼	4.5
A502	2¾ x 2¾	3/16	3.39
A503	2¾ x 2¾	⅛	2.29
A46	2½ x 2½	½	7.7
A47	2½ x 2½	7/16	6.8
A48	2½ x 2½	⅜	5.9
A49	2½ x 2½	5/16	5.0
A50	2½ x 2½	¼	4.1
A100	2½ x 2½	3/16	3.07
A504	2½ x 2½	⅛	2.08
A51	2¼ x 2¼	½	6.8
A52	2¼ x 2¼	7/16	6.1
A53	2¼ x 2¼	⅜	5.3
A54	2¼ x 2¼	5/16	4.5
A55	2¼ x 2¼	¼	3.62
A101	2¼ x 2¼	3/16	2.75
A505	2¼ x 2¼	⅛	1.86
A56	2 x 2	7/16	5.3
A57	2 x 2	⅜	4.7
A58	2 x 2	5/16	3.92
A59	2 x 2	¼	3.19
A60	2 x 2	3/16	2.44
A506	2 x 2	⅛	1.65
A61	1¾ x 1¾	7/16	4.6
A62	1¾ x 1¾	⅜	3.99
A63	1¾ x 1¾	5/16	3.39
A64	1¾ x 1¾	¼	2.77
A65	1¾ x 1¾	3/16	2.12
A507	1¾ x 1¾	¼	1.44
A66	1½ x 1½	⅜	3.35
A67	1½ x 1½	5/16	2.86
A68	1½ x 1½	¼	2.34
A69	1½ x 1½	3/16	1.80
A102	1½ x 1½	⅛	1.23
A70	1¼ x 1¼	5/16	2.33
A71	1¼ x 1¼	¼	1.92
A72	1¼ x 1¼	3/16	1.48
A73	1¼ x 1¼	⅛	1.01
A508	1⅛ x 1⅛	3/16	1.32
A509	1⅛ x 1⅛	⅛	0.91
A78	1 x 1	¼	1.49
A79	1 x 1	3/16	1.16
A80	1 x 1	⅛	0.80
A81	⅞ x ⅞	3/16	1.00
A82	⅞ x ⅞	⅛	0.70
A511	⅞ x ⅞	3/32	0.53
A83	¾ x ¾	3/16	0.84
A84	¾ x ¾	⅛	0.59
A512	¾ x ¾	3/32	0.45
A513	⅝ x ⅝	⅛	0.48
A514	⅝ x ⅝	3/32	0.37
A515	½ x ½	⅛	0.38
A516	½ x ½	3/32	0.29

TABLE 3

Steel Shapes (Bar Mill Sizes). Unequal-Leg Angles

Section Index	Size, Inches	Thickness, Inches	Weight per Foot Pounds
A264	2½ x 2	½	6.8
A265	2½ x 2	7/16	6.1
A266	2½ x 2	⅜	5.3
A267	2½ x 2	5/16	4.5
A268	2½ x 2	¼	3.62
A269	2½ x 2	3/16	2.75
A523	2½ x 2	⅛	1.86
A650	2½ x 1¾	5/16	4.2
A608	2½ x 1¾	¼	3.40
A609	2½ x 1¾	3/16	2.59
A610	2½ x 1½	5/16	3.92
A611	2½ x 1½	¼	3.19
A612	2½ x 1½	3/16	2.44
A270	2¼ x 1½	½	5.6
A271	2¼ x 1½	7/16	5.0
A272	2¼ x 1½	⅜	4.4
A273	2¼ x 1½	5/16	3.66
A274	2¼ x 1½	¼	2.98
A275	2¼ x 1½	3/16	2.28
A631	2 x 1½	⅜	3.99
A614	2 x 1½	5/16	3.39
A615	2 x 1½	¼	2.77
A616	2 x 1½	3/16	2.12
A525	2 x 1½	⅛	1.44
A289	2 x 1⅜	⅜	3.83
A209	2 x 1⅜	5/16	3.26
A276	2 x 1⅜	¼	2.66
A277	2 x 1⅜	3/16	2.04
A646	2 x 1¼	¼	2.55
A645	2 x 1¼	3/16	1.96
A618	1¾ x 1¼	¼	2.34
A619	1¾ x 1¼	3/16	1.80
A620	1¾ x 1¼	⅛	1.23
A621	1¾ x 1⅛	¼	2.24
A622	1¾ x 1⅛	3/16	1.72
A660	1¾ x 1⅛	⅛	1.17
A670	1½ x 1¼	5/16	2.59
A623	1½ x 1¼	¼	2.13
A624	1½ x 1¼	3/16	1.64
A278	1⅜ x 1	¼	1.81
A281	1⅜ x 1	3/16	1.40
A279	1⅜ x 1	⅛	0.96
A625	1⅜ x ⅞	3/16	1.32
A626	1⅜ x ⅞	⅛	0.91
A960	1¼ x ⅞	⅛	0.85
A627	1 x ¾	3/16	1.00
A628	1 x ¾	⅛	0.70
A629	1 x ⅝	3/16	0.92
A630	1 x ⅝	⅛	0.64

TABLE 4

Steel Shapes (Bar Mill Sizes). Equal-Leg Tees

Section Index	Size, Inches		Thickness, Inches		Weight per Foot Pounds
	Flange	Stem	Flange	Stem	
T10	2½	2½	3/8 to 7/16	3/8 to 7/16	6.4
T11	2½	2½	5/16 to 3/8	5/16 to 3/8	5.5
T12	2¼	2¼	5/16 to 3/8	5/16 to 3/8	4.9
T13	2¼	2¼	1/4 to 5/16	1/4 to 5/16	4.1
T14	2	2	5/16 to 3/8	5/16 to 3/8	4.3
T15	2	2	1/4 to 5/16	1/4 to 5/16	3.56
T16	1¾	1¾	1/4 to 5/16	1/4 to 5/16	3.09
T514	1¾	1¾	1/4 to 1/4	1/4	2.90
T500	1¾	1¾	3/16 to 3/16	3/16	2.26
T17	1½	1½	1/4 to 9/32	1/4 to 9/32	2.47
T513	1½	1½	1/4 to 1/4	1/4	2.43
T18	1½	1½	3/16 to 7/32	3/16 to 7/32	1.94
T512	1½	1½	3/16 to 3/16	3/16	1.90
T19	1¼	1¼	1/4 to 9/32	1/4 to 9/32	2.02
T511	1¼	1¼	1/4 to 1/4	1/4	1.98
T20	1¼	1¼	3/16 to 7/32	3/16 to 7/32	1.59
T510	1¼	1¼	3/16 to 3/16	3/16	1.55
T501	1¼	1¼	1/8 to 1/8	1/8	1.09
T502	1⅛	1⅛	3/16 to 3/16	3/16	1.37
T503	1⅛	1⅛	1/8 to 1/8	1/8	0.97
T504	1	1	1/4 to 1/4	1/4	1.53
T21	1	1	3/16 to 7/32	3/16 to 7/32	1.25
T515	1	1	3/16 to 3/16	3/16	1.20
T22	1	1	1/8 to 5/32	1/8 to 5/32	0.89
T516	1	1	1/8 to 1/8	1/8	0.85
T505	7/8	7/8	1/8 to 1/8	1/8	0.73
T506	3/4	3/4	1/8 to 1/8	1/8	0.61
T507	5/8	5/8	1/8 to 1/8	1/8	0.50
T509	1/2	1/2	1/8 to 1/8	3/32 to 3/32	0.34

TABLE 5

Unequal-Leg Tees

Section Index	Size, Inches		Thickness, Inches		Weight per Foot Pounds
	Flange	Stem	Flange	Stem	
T86	2½	1¼	3/16 to 9/32	3/16 to 5/16	2.87
T87	2	1½	1/4 to 5/16	1/4 to 5/16	3.09
T519	1½	2	3/16 to 1/4	3/16 to 1/4	2.45
T605	1½	1¼	1/8 to 5/32	1/8 to 5/32	1.25

TABLE 6

Flat Steel Bars

Weight in Pounds per Lineal Foot

Width (Inches)	Thickness in Inches											
	1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4
1/4	.05	.11	.16	.21	---	---	---	---	---	---	---	---
1/2	.11	.21	.32	.43	.53	.64	.74	.85	---	---	---	---
3/4	.16	.32	.48	.64	.80	.96	1.12	1.28	1.43	1.59	1.75	1.91
1	.21	.43	.64	.85	1.06	1.28	1.49	1.70	1.91	2.13	2.34	2.55
1 1/4	.27	.53	.80	1.06	1.33	1.59	1.86	2.13	2.39	2.66	2.92	3.19
1 1/2	.32	.64	.96	1.28	1.59	1.91	2.23	2.55	2.87	3.19	3.51	3.83
1 3/4	.37	.74	1.12	1.49	1.86	2.23	2.60	2.98	3.35	3.72	4.09	4.46
2	.43	.85	1.28	1.70	2.13	2.55	2.98	3.40	3.83	4.25	4.68	5.10
2 1/4	.48	.96	1.43	1.91	2.39	2.87	3.35	3.83	4.30	4.78	5.26	5.74
2 1/2	.53	1.06	1.59	2.13	2.66	3.19	3.72	4.25	4.78	5.31	5.84	6.38
2 3/4	.58	1.17	1.75	2.34	2.92	3.51	4.09	4.68	5.26	5.84	6.43	7.01
3	.64	1.28	1.91	2.55	3.19	3.83	4.46	5.10	5.74	6.38	7.01	7.65
3 1/4	.69	1.38	2.07	2.76	3.45	4.14	4.83	5.53	6.22	6.91	7.60	8.29
3 1/2	.74	1.49	2.23	2.98	3.72	4.46	5.21	5.95	6.69	7.44	8.18	8.93
3 3/4	.80	1.59	2.39	3.19	3.98	4.78	5.58	6.38	7.17	7.97	8.77	9.56

TABLE 7

Square and Round Rods

Weight in Pounds per Lineal Foot and Cross Sectional Area in Square Inches

Thickness or Diameter in Inches	Weight of □ Bar One Foot Long	Weight of ○ Bar One Foot Long	Area of □ Bar in Square Inches	Area of ○ Bar in Square Inches
1/16	.013	.010	.0039	.0031
1/8	.053	.042	.0156	.0123
3/16	.119	.094	.0352	.0276
1/4	.212	.167	.0625	.0491
5/16	.333	.261	.0977	.0767
3/8	.478	.375	.1406	.1104
7/16	.651	.511	.1914	.1503
1/2	.850	.667	.2500	.1963
9/16	1.076	.845	.3164	.2485
5/8	1.328	1.043	.3906	.3068
11/16	1.608	1.262	.4727	.3712
3/4	1.913	1.502	.5625	.4418
13/16	2.245	1.763	.6602	.5185
7/8	2.603	2.044	.7656	.6013
15/16	2.989	2.347	.8789	.6903
1	3.400	2.670	1.0000	.7854
1 1/16	3.838	3.014	1.1289	.8866
1 1/8	4.303	3.379	1.2656	.9940
1 3/16	4.795	3.766	1.4102	1.1075
1 1/4	5.312	4.173	1.5625	1.2272
1 5/16	5.857	4.600	1.7227	1.3530
1 3/8	6.428	5.049	1.8906	1.4849
1 7/16	7.026	5.518	2.0664	1.6230
1 1/2	7.650	6.008	2.2500	1.7671

TABLE 8

Bolts and Nuts

(Manufacturers' Standard Sizes)

Weights in Pounds of 100 Bolts with Square Heads and Nuts

Length under Head to Point (Inches)	Diameter of Bolts						
	¼ Inch	5/16 Inch	⅜ Inch	7/16 Inch	½ Inch	⅝ Inch	¾ Inch
1½	4.0	7.0	10.5	15.2	22.5	39.5	63.0
1¾	4.4	7.5	11.3	16.3	23.8	41.6	66.0
2	4.8	8.0	12.0	17.4	25.2	43.8	69.0
2¼	5.2	8.5	12.8	18.5	26.5	45.8	72.0
2½	5.5	9.0	13.5	19.6	27.8	48.0	75.0
2¾	5.8	9.5	14.3	20.7	29.1	50.1	78.0
3	6.3	10.0	15.0	21.8	30.5	52.3	81.0
3½	7.0	11.0	16.5	24.0	33.1	56.5	87.0
4	7.8	12.0	18.0	26.2	35.8	60.8	93.1
4½	8.5	13.0	19.5	28.4	38.4	65.0	99.1
5	9.3	14.0	21.0	30.6	41.1	69.3	105.2
5½	10.0	15.0	22.5	32.8	43.7	73.5	111.3
6	10.8	16.0	24.0	35.0	46.4	77.8	117.3
6½	---	---	25.5	37.2	49.0	82.0	123.4
7	---	---	27.0	39.4	51.7	86.3	129.4
7½	---	---	28.5	41.6	54.3	90.5	135.0
8	---	---	30.0	43.8	59.6	94.8	141.5
9	---	---	---	46.0	64.9	103.3	153.6
10	---	---	---	48.2	70.2	111.8	165.7
11	---	---	---	50.4	75.5	120.3	177.8
12	---	---	---	52.6	80.8	128.8	189.9
Per Inch Additional	1.4	2.1	3.1	4.2	5.5	8.5	12.3

TABLE 9

Dimensions and Weights of Square Bolt Heads and Nuts

Diameter of Bolt (Inches)	Square Head				Square Nut			
	Short Diameter (Inches)	Long Diameter (Inches)	Thick-ness (Ins.)	Weight per 100 (Pounds)	Short Diameter (Inches)	Long Diameter (Inches)	Thick-ness (Ins.)	Weight per 100 (Pounds)
¼	7/16	.619	3/16	1.0	½	.707	¼	1.5
5/16	½	.707	¼	1.7	⅝	.884	5/16	2.8
⅜	19/32	.840	9/32	2.8	¾	1.061	⅜	4.8
7/16	11/16	.972	⅜	4.9	⅞	1.237	7/16	7.5
½	¾	1.061	7/16	6.8	1	1.414	½	11.9
⅝	15/16	1.326	17/32	13.0	1⅛	1.591	⅝	17.3
¾	1⅛	1.591	⅝	22.0	1¼	1.768	¾	27.8

TABLE 10

Lag Screws

Weights in Pounds of 100 Lag Screws

Length of Screw (Inches)	Diameter in Inches						
	5/16	3/8	7/16	1/2	9/16	5/8	3/4
1½	4.75	7.10	9.88	13.90	----	----	----
2	5.75	8.10	11.63	15.80	24.00	26.25	----
2½	6.75	9.35	13.40	17.90	26.00	29.25	46.50
3	7.75	10.65	15.10	19.87	28.00	33.50	51.50
3½	8.75	11.95	16.50	22.00	31.00	36.50	56.50
4	9.75	13.30	18.60	24.30	34.00	39.50	61.50
4½	10.75	14.70	20.40	26.87	37.00	42.20	67.00
5	11.75	16.10	22.10	29.00	40.00	46.00	72.25
5½	12.75	17.50	23.80	31.50	43.00	49.40	78.00
6	13.75	18.90	25.50	34.00	46.00	53.00	83.50
7	----	----	29.25	39.00	52.00	60.00	94.00
8	----	----	33.00	44.00	58.00	67.50	104.50
9	----	----	----	49.00	64.00	75.00	115.00
10	----	----	----	54.00	70.00	82.50	126.00
11	----	----	----	----	76.00	90.00	137.00
12	----	----	----	----	82.00	98.00	148.00

TABLE 11

Washers

Dimensions and Weights of Circular Flat Plate Washers

Diameter of Bolt (Inches)	Diameter of Washer (Inches)	Diameter of Hole (Inches)	Thickness of Washer		Number of Washers per 100 Pounds
			U. S. Gage	Inches	
1/4	3/4	5/16	16	.0625	15552
5/16	7/8	3/8	16	.0625	11547
3/8	1	7/16	14	.0781	7142
7/16	1¼	1/2	14	.0781	4401
1/2	1⅜	9/16	12	.1093	2621
9/16	1½	5/8	12	.1093	2219
5/8	1¾	11/16	10	.1406	1238
3/4	2	13/16	10	.1406	960

Square Yard Tables for Walls and Ceilings

THROUGH the courtesy of the Acme Cement Plaster Company of St. Louis, Missouri, we offer the following tables, reprinted from their catalogue, describing Acme Cement Plaster.

These tables will be useful in estimating the square yards of surface in the walls and ceilings of rooms having various dimensions. The quantities as given represent the complete area in the four walls and ceiling without any allowance for openings.

TABLE 12

Square Yards and Square Feet in Walls and Ceilings

8′–0″ Ceiling Height

Width of Room (Feet)	Length of Room in Feet																			
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
3	11.6	13.7	15.8	18.0	20.1	22.2	24.3	26.4	28.5	30.6	32.7	34.8	37.0	39.1	41.2	43.3	45.4	47.5	49.6	51.7
4	13.7	16.0	18.2	20.4	22.6	24.8	27.1	29.3	31.5	33.7	36.0	38.2	40.4	42.6	44.8	47.1	49.3	51.5	53.7	56.0
5	15.8	18.2	20.5	22.8	25.2	27.5	29.8	32.2	34.5	36.8	39.2	41.5	43.8	46.2	48.5	50.8	53.2	55.5	57.8	60.2
6	18.0	20.4	22.8	25.3	27.7	30.2	32.6	35.1	37.5	40.0	42.4	44.8	47.3	49.7	52.2	54.6	57.1	59.5	62.0	64.4
7	20.1	22.6	25.2	27.7	30.3	32.8	35.4	38.0	40.5	43.1	45.6	48.2	50.7	53.3	55.8	58.4	61.0	63.5	66.1	68.9
8	22.2	24.8	27.5	30.2	32.8	35.5	38.2	40.8	43.5	46.2	48.8	51.5	54.2	56.8	59.5	62.2	64.8	67.5	70.2	72.8
9	24.3	27.1	29.8	32.6	35.4	38.2	41.0	43.7	46.5	49.3	52.1	54.8	57.6	60.4	63.2	66.0	68.7	71.5	74.3	77.1
10	26.4	29.3	32.2	35.1	38.0	40.8	43.7	46.6	49.5	52.4	55.3	58.2	61.1	64.0	66.8	69.7	72.6	75.5	78.4	81.3
11	28.5	31.5	34.5	37.5	40.5	43.5	46.5	49.5	52.5	55.5	58.5	61.5	64.5	67.5	70.5	73.5	76.5	79.5	82.5	85.5
12	30.6	33.7	36.8	40.0	43.1	46.2	49.3	52.4	55.5	58.6	61.7	64.8	68.0	71.1	74.2	77.3	80.4	83.5	86.6	89.7
13	32.7	36.0	39.2	42.4	45.6	48.8	52.1	55.3	58.5	61.7	65.0	68.2	71.4	73.6	77.8	81.1	84.3	87.5	90.7	94.0
14	34.8	38.2	41.5	44.8	48.2	51.5	54.8	58.2	61.5	64.8	68.2	71.5	74.8	78.2	81.5	84.8	88.2	91.5	94.8	98.2
15	37.0	40.4	43.8	47.3	50.7	54.2	57.6	61.1	64.5	68.0	71.4	74.8	78.3	81.7	85.2	88.6	92.1	95.5	99.0	102.4
16	39.1	42.6	46.2	49.7	53.3	56.8	60.4	64.0	67.5	71.1	74.6	78.2	81.7	85.3	88.8	92.4	96.0	99.5	103.1	106.6
17	41.2	44.8	48.5	52.5	55.8	59.5	63.2	66.8	70.5	74.2	77.8	81.5	85.2	88.8	92.5	96.2	99.8	103.5	107.2	110.8
18	43.3	47.1	50.8	54.6	58.4	62.2	66.0	69.7	73.5	77.3	81.1	84.8	88.6	92.4	96.2	100.0	103.7	107.5	111.3	115.1
19	45.4	49.3	53.2	57.1	61.0	64.8	68.7	72.6	76.5	80.4	84.3	88.2	92.1	96.0	99.8	103.7	107.6	111.5	115.4	119.3
20	47.5	51.5	55.5	59.5	63.5	67.5	71.5	75.5	79.5	83.5	87.5	91.5	95.5	99.5	103.5	107.5	111.5	115.5	119.5	123.5
21	49.6	53.7	57.8	62.0	66.1	70.2	74.3	78.4	82.5	86.6	90.7	94.8	99.0	103.1	107.2	111.3	115.4	119.5	123.6	127.7
22	51.7	56.0	60.2	64.4	68.8	72.8	77.1	81.3	85.5	89.7	94.0	98.2	102.4	106.6	110.8	115.1	119.3	123.5	127.7	132.0
23	53.8	58.2	62.5	66.8	71.2	75.5	79.8	84.2	88.5	92.8	97.2	101.5	105.8	110.2	114.5	118.8	123.2	127.5	131.8	136.2
24	56.0	60.4	64.8	69.3	73.7	78.2	82.6	87.1	91.5	96.0	100.4	104.8	109.3	113.7	118.2	122.6	127.1	131.5	136.0	140.4

Each quantity represents area of four walls and ceiling. Square yards at left of decimal point and fraction of a yard in square feet at right.

TABLE 13

Square Yards and Square Feet in Walls and Ceilings

8′–6″ Ceiling Height

Width of Room (Feet)	Length of Room in Feet																			
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
3	12.3	14.5	16.7	19.0	21.2	23.4	25.6	27.8	30.1	32.2	34.5	36.7	39.0	41.2	43.4	45.6	47.8	50.1	52.3	54.5
4	14.5	16.8	19.2	21.5	23.8	26.2	28.5	30.8	33.2	35.5	37.8	40.2	42.5	44.8	47.2	49.5	51.8	54.2	56.5	58.8
5	16.7	19.2	21.6	24.1	26.5	29.0	31.4	33.8	36.3	38.7	41.2	43.6	46.1	48.5	51.0	53.4	55.8	58.3	60.7	63.2
6	19.0	21.5	24.1	26.6	29.2	31.7	34.3	36.8	39.4	42.0	44.5	47.1	49.6	52.5	54.7	57.3	59.8	62.4	65.0	67.5
7	21.2	23.8	26.5	29.2	31.8	34.5	37.2	39.8	42.5	45.2	47.8	50.5	53.2	55.8	58.5	61.2	63.8	66.5	69.2	71.8
8	23.4	26.2	29.0	31.7	34.5	37.3	40.1	42.8	45.6	48.4	51.2	54.0	56.7	59.5	62.3	65.1	67.8	70.6	73.4	76.2
9	25.6	28.5	31.4	34.3	37.2	40.1	43.0	45.8	48.7	51.6	54.5	57.4	60.3	63.2	66.1	69.0	71.8	74.7	77.6	80.5
10	27.8	30.8	33.8	36.8	39.8	42.8	45.8	48.8	51.8	54.8	57.8	60.8	63.8	66.8	69.8	72.8	75.8	78.8	81.8	84.8
11	30.1	33.2	36.3	39.4	42.5	45.6	48.7	51.8	55.0	58.1	61.2	64.3	67.4	70.5	73.6	76.7	79.8	83.0	86.1	89.2
12	32.2	35.5	38.7	42.0	45.2	48.4	51.6	54.8	58.1	61.3	64.5	67.7	71.0	74.2	77.4	80.6	83.8	87.1	90.3	93.5
13	34.5	37.8	41.2	44.5	47.8	51.2	54.5	57.8	61.2	64.5	67.8	71.2	74.5	77.8	81.2	84.5	87.8	91.2	94.5	97.8
14	36.7	40.2	43.6	47.1	50.5	54.0	57.4	60.8	64.3	67.7	71.2	74.6	78.1	81.5	85.0	88.4	91.8	95.3	98.7	102.2
15	39.0	42.5	46.1	49.6	53.2	56.7	60.3	63.8	67.4	71.0	74.5	78.1	81.6	85.2	88.7	92.3	95.8	99.4	103.0	106.5
16	41.2	44.8	48.5	52.2	55.8	59.5	63.2	66.8	70.5	74.2	77.8	81.5	85.2	88.8	92.5	96.2	99.8	103.5	107.2	110.8
17	43.4	47.2	51.0	54.7	58.5	62.3	66.1	69.8	73.6	77.4	81.2	85.0	88.7	92.5	96.3	100.1	103.8	107.6	111.4	115.2
18	45.6	49.5	53.4	55.3	61.2	65.1	69.0	72.8	76.7	80.6	84.5	88.4	92.3	96.2	100.1	104.0	107.8	111.7	115.6	119.5
19	47.8	51.8	55.8	59.8	63.8	67.8	71.8	75.8	79.8	83.8	87.8	91.8	95.8	99.8	103.8	107.8	111.8	115.8	119.8	123.8
20	50.1	54.2	58.3	62.4	66.5	70.6	74.7	78.8	83.0	87.1	91.2	95.3	99.4	103.5	107.6	111.7	115.8	120.0	124.1	128.2
21	52.3	56.5	60.7	65.0	69.2	73.4	77.6	81.8	86.1	90.3	94.5	98.7	103.0	107.2	111.4	115.6	119.8	124.1	128.3	132.5
22	54.5	58.8	63.2	67.5	71.8	76.2	80.5	84.8	89.2	93.5	97.8	102.2	106.5	110.8	115.2	119.5	123.8	128.2	132.5	136.8
23	56.7	61.2	65.6	70.1	74.5	79.0	83.4	87.8	92.3	96.7	101.2	105.6	110.1	114.5	119.1	123.4	127.8	132.3	136.7	141.2
24	59.0	63.5	68.1	72.6	77.2	81.7	86.3	90.8	95.4	100.0	104.5	109.1	113.6	118.2	122.7	127.3	131.8	136.4	141.0	145.5

Each quantity represents area of four walls and ceiling. Square yards at left of decimal point and fraction of a yard in square feet at right.

TABLE 14

Square Yards and Square Feet in Walls and Ceilings

9′–0″ Ceiling Height

Width of Room (Feet)	Length of Room in Feet																			
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
3	13.0	15.3	17.6	20.0	22.3	24.6	27.0	29.3	31.6	34.0	36.3	38.6	41.0	43.3	45.6	48.0	50.3	52.6	55.0	57.3
4	15.3	17.7	20.2	22.6	25.1	27.5	30.0	32.4	34.8	37.3	39.7	42.2	44.6	47.1	49.5	52.0	54.4	56.8	59.3	61.7
5	17.6	20.2	22.7	25.3	27.8	30.4	33.0	35.5	38.1	40.6	43.2	45.7	48.3	50.8	53.4	56.0	58.5	61.1	63.6	66.2
6	20.0	22.6	25.3	28.0	30.6	33.3	36.0	38.6	41.3	44.0	46.6	49.3	52.0	54.6	57.3	60.0	63.5	65.4	68.0	70.6
7	22.3	25.1	27.8	30.6	33.4	36.2	39.0	41.7	44.5	47.3	50.1	52.8	55.6	58.4	61.2	64.0	66.7	69.5	72.3	75.1
8	24.6	27.5	30.4	33.3	36.2	39.1	42.0	44.8	47.7	50.6	53.5	56.4	59.3	62.2	65.1	68.0	70.8	73.7	77.6	79.5
9	27.0	30.0	33.0	36.0	39.0	42.0	45.0	48.0	51.0	54.0	57.0	60.0	63.0	66.0	69.0	72.0	75.0	78.0	81.0	84.0
10	29.3	32.4	35.5	38.6	41.7	44.8	48.0	52.0	54.2	57.3	60.4	63.5	66.6	69.7	72.8	76.0	79.1	82.2	85.3	88.4
11	31.6	34.8	38.1	41.3	44.5	47.7	51.0	54.2	57.4	60.6	63.8	67.1	70.3	73.5	76.7	80.0	83.2	86.4	89.6	92.8
12	34.0	37.3	40.6	44.0	47.3	50.6	54.0	57.3	60.6	64.0	67.3	70.6	74.0	77.3	80.6	84.0	87.3	90.6	94.0	97.3
13	36.3	39.7	43.2	46.6	50.1	53.5	57.0	60.4	63.8	67.3	70.7	74.2	77.6	81.1	84.5	88.0	91.4	94.8	98.3	101.7
14	38.6	42.2	45.7	49.3	52.8	56.4	60.0	63.5	67.1	70.6	74.2	77.7	81.3	84.8	88.4	92.0	95.5	99.1	102.6	106.2
15	41.0	44.6	48.3	52.0	55.6	59.3	63.0	66.6	70.3	74.0	77.6	81.3	85.0	88.6	92.3	96.0	99.6	103.3	107.0	111.6
16	43.3	47.1	50.8	54.6	58.4	62.2	66.0	69.7	73.5	77.3	81.1	84.8	88.6	92.4	96.2	100.0	103.7	107.5	111.3	115.1
17	45.6	49.5	53.4	57.3	61.2	65.1	69.0	72.8	76.7	80.6	84.5	88.4	92.3	96.2	100.4	104.0	107.8	111.7	115.6	119.5
18	48.0	52.0	56.0	60.0	64.0	68.0	72.0	76.0	80.0	84.0	88.0	92.0	96.0	100.0	104.0	108.0	112.0	116.0	120.0	124.0
19	50.3	54.4	58.5	62.6	66.7	70.8	75.0	79.1	83.2	87.3	91.4	95.5	99.6	103.7	107.8	112.0	116.1	120.2	124.3	128.4
20	52.6	56.8	61.1	65.3	69.5	73.7	78.0	82.2	86.4	90.6	94.8	99.1	103.3	107.5	111.7	116.0	120.2	124.4	128.6	132.8
21	55.0	59.3	63.6	68.0	72.3	76.6	81.0	85.3	89.6	94.0	98.3	102.6	107.0	111.3	115.6	120.0	124.3	128.6	134.3	137.3
22	57.3	61.7	66.2	70.6	75.1	79.5	84.0	88.4	92.8	97.3	101.7	106.2	111.6	115.1	121.5	124.0	128.4	132.8	137.3	141.7
23	59.6	64.2	68.7	73.3	77.8	82.4	87.0	91.5	95.1	100.6	105.2	109.7	114.3	118.8	123.4	128.0	132.5	137.0	141.6	146.2
24	62.0	66.6	71.3	76.0	80.6	85.3	90.0	94.6	99.3	104.0	108.6	113.3	118.0	122.6	127.3	132.0	136.6	141.3	146.0	150.6

Each quantity represents area of four walls and ceiling. Square yards at left of decimal point and fraction of a yard in square feet at right.

TABLE 15

Square Yards and Square Feet in Walls and Ceilings

9′–6″ Ceiling Height

Width of Room (Feet)	Length of Room in Feet																			
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
3	13.6	16.1	18.5	21.0	23.4	25.8	28.3	30.7	33.2	35.6	38.1	40.5	43.0	45.4	47.8	50.3	52.7	55.2	57.6	60.1
4	16.1	18.6	21.2	23.7	26.3	28.8	31.4	34.0	36.5	39.1	41.6	44.2	46.7	49.3	51.8	54.4	57.0	59.5	62.1	64.6
5	18.5	21.2	23.8	26.5	29.2	31.8	34.5	37.2	39.8	42.5	45.2	47.8	50.5	53.2	55.8	58.5	61.2	63.8	66.5	69.2
6	21.0	23.7	26.5	29.3	32.1	34.8	37.6	40.4	43.2	46.0	48.7	51.5	54.3	57.1	59.8	62.6	65.4	68.2	71.0	73.7
7	23.4	26.3	29.2	32.1	35.0	37.8	40.7	43.6	46.5	49.4	52.3	55.2	58.1	61.0	63.8	66.7	69.6	72.5	75.4	78.3
8	25.8	28.8	31.8	34.8	37.8	40.8	43.8	46.8	49.8	52.8	55.8	58.8	61.8	64.8	67.8	70.8	73.8	76.8	79.8	82.8
9	28.3	31.4	34.5	37.6	40.7	43.8	47.0	50.1	53.2	56.3	59.4	62.5	65.6	68.7	71.8	75.0	78.1	81.2	84.3	87.4
10	30.7	34.0	37.2	40.4	43.6	46.8	50.1	53.3	56.5	59.7	63.0	66.2	69.4	72.6	75.8	79.1	82.3	85.5	88.7	92.0
11	33.2	36.5	39.8	43.2	46.5	49.8	53.2	56.5	59.8	63.2	66.5	69.8	73.2	76.5	79.8	83.2	86.5	89.8	93.2	96.5
12	35.6	39.1	42.5	46.0	49.4	52.8	56.3	59.7	63.2	66.5	70.1	73.5	77.0	80.4	83.8	87.3	90.7	94.2	97.6	101.1
13	38.1	41.6	45.2	48.7	52.3	55.8	59.4	63.0	66.5	70.1	73.6	77.2	80.7	84.3	87.8	91.4	95.0	98.5	102.1	105.6
14	40.5	44.2	47.8	51.5	55.2	58.8	62.5	66.2	69.8	73.5	77.2	80.8	84.5	88.2	91.8	95.5	99.2	102.8	106.5	110.2
15	43.0	46.7	50.5	54.3	58.1	61.8	65.6	69.4	73.2	77.0	80.7	84.5	88.3	92.1	95.8	99.6	103.4	107.2	111.0	114.7
16	45.4	49.3	53.2	57.1	61.0	64.8	68.7	72.6	76.5	80.4	84.3	88.2	92.1	96.0	99.8	103.7	107.6	111.5	115.4	119.3
17	47.8	51.8	55.8	59.8	63.8	67.8	71.8	75.8	79.8	83.8	87.8	91.8	95.8	99.8	103.8	107.8	111.8	115.8	119.8	123.8
18	50.3	54.4	58.5	62.6	66.7	70.8	75.0	79.1	83.2	87.3	91.4	95.5	99.6	103.7	107.8	112.0	116.1	120.2	124.3	128.4
19	52.7	57.0	61.2	65.4	69.6	73.8	78.1	82.3	86.5	90.7	95.0	99.0	103.4	107.6	111.8	116.1	120.3	124.5	128.7	133.0
20	55.2	59.5	63.8	68.2	72.5	76.8	81.2	85.5	89.8	94.2	98.5	102.8	107.2	111.5	115.8	120.2	124.5	128.8	133.2	137.5
21	57.6	62.1	66.5	71.0	75.4	79.8	84.3	88.7	93.2	97.6	102.1	106.5	111.0	115.4	119.8	124.3	128.7	133.2	137.6	142.1
22	60.1	64.6	69.2	73.7	78.3	82.8	87.4	92.0	96.5	101.1	105.6	110.2	114.7	119.3	123.8	128.4	133.0	137.5	142.1	146.6
23	62.5	67.2	71.8	76.5	81.2	85.8	90.5	95.2	99.8	104.5	109.2	113.8	118.5	123.2	127.8	132.5	137.2	141.8	146.5	151.2
24	65.0	69.7	74.5	79.3	84.1	88.8	93.6	98.4	103.2	108.0	112.7	117.5	122.3	127.1	131.8	136.6	141.4	146.2	151.0	155.7

Each quantity represents area of four walls and ceiling. Square yards at left of decimal point and fraction of a yard in square feet at right.

TABLE 16

Square Yards and Square Feet in Walls and Ceilings

10′–0″ Ceiling Height

Width of Room (Feet)	Length of Room in Feet																			
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
3	14.3	16.8	19.4	22.0	24.5	27.1	29.6	32.2	34.7	37.3	39.8	42.4	45.0	47.5	50.1	52.6	55.2	57.7	60.3	62.8
4	16.8	19.5	22.2	24.8	27.5	30.2	32.8	35.5	38.2	40.8	43.5	46.2	48.8	51.5	54.2	56.8	59.5	62.2	64.8	67.5
5	19.4	22.2	25.0	27.7	30.5	33.3	36.1	38.8	41.6	44.4	47.2	50.0	52.7	55.5	58.3	61.1	63.8	66.6	69.4	72.2
6	22.0	24.8	27.7	30.6	33.5	36.4	39.3	42.2	45.1	48.0	50.8	53.7	56.6	59.5	62.4	65.3	68.2	71.1	74.0	76.8
7	24.5	27.5	30.5	33.5	36.5	39.5	42.5	45.5	48.5	51.5	54.5	57.5	60.5	63.5	66.5	69.5	72.5	75.5	78.5	81.5
8	27.1	30.2	33.3	36.4	39.5	42.6	45.7	48.8	52.0	55.1	58.2	61.3	64.4	67.5	70.6	73.7	76.8	80.0	83.1	86.2
9	29.6	32.8	36.1	39.3	42.5	45.7	49.0	52.2	55.4	58.6	61.8	65.1	68.3	71.5	74.7	78.0	81.2	84.4	87.6	90.8
10	32.3	35.5	38.8	42.2	45.5	48.8	52.2	55.5	58.8	62.2	65.5	68.8	72.2	75.5	78.8	82.2	85.5	88.8	92.2	95.5
11	34.7	38.2	41.6	45.1	48.5	52.0	55.4	58.8	62.3	65.7	69.2	72.6	76.1	79.5	83.0	86.4	89.8	93.3	96.7	100.2
12	37.3	40.8	44.4	48.0	51.5	55.1	58.6	62.2	65.7	69.3	72.8	76.4	80.0	83.5	87.1	90.6	94.2	97.7	101.3	104.8
13	39.8	43.5	47.2	50.8	54.5	58.2	61.8	65.5	69.2	72.8	76.5	80.2	83.8	87.5	91.2	94.8	98.5	102.2	105.8	109.5
14	42.4	46.2	50.0	53.7	57.5	61.3	65.1	68.8	72.6	76.4	80.2	84.0	87.7	91.5	95.3	99.1	102.8	106.6	110.4	114.2
15	45.0	48.8	52.7	56.6	60.5	64.4	68.3	72.2	76.1	80.0	83.8	87.7	91.6	95.5	99.4	103.3	107.2	111.1	115.0	118.8
16	47.5	51.5	55.5	59.5	63.5	67.5	71.5	75.5	79.5	83.5	87.5	91.5	95.5	99.5	103.5	107.5	111.5	115.5	119.5	123.5
17	50.1	54.2	58.3	62.4	66.5	70.6	74.7	78.8	83.0	87.1	91.2	95.3	99.4	103.5	107.6	111.7	115.8	120.0	124.1	128.2
18	52.6	56.8	61.1	65.3	69.5	73.7	78.0	82.2	86.4	90.6	94.8	99.1	103.3	107.5	111.7	116.0	120.2	124.4	128.6	132.8
19	55.2	59.5	63.8	68.2	72.5	76.8	81.2	85.5	89.8	94.2	98.5	102.8	107.2	111.5	115.8	120.2	124.5	128.8	133.2	137.5
20	57.7	62.2	66.6	71.1	75.5	80.0	84.4	88.8	93.3	97.7	102.2	106.6	111.1	115.5	120.0	124.4	128.8	133.3	137.7	142.2
21	60.3	64.8	69.4	74.0	78.5	83.1	87.6	92.2	96.7	101.3	105.8	110.4	115.0	119.5	124.1	128.6	133.2	137.7	142.3	146.8
22	62.8	67.5	72.2	76.8	81.5	86.2	90.8	95.5	100.2	104.8	109.5	114.2	118.8	123.5	128.2	132.8	137.5	142.2	146.8	151.5
23	65.4	70.2	75.0	79.7	84.5	89.3	94.1	98.8	103.6	108.4	113.2	116.6	121.7	127.5	132.3	137.1	141.8	146.6	151.4	156.2
24	68.0	72.8	77.7	82.6	87.5	92.4	97.3	102.2	107.1	112.1	114.8	118.0	122.7	131.5	136.4	141.3	146.2	151.1	156.0	160.8

Each quantity represents area of four walls and ceiling. Square yards at left of decimal point and fraction of a yard in square feet at right.

TABLE 17

Square Yards and Square Feet in Walls and Ceilings

10′–6″ Ceiling Height

Width of Room (Feet)	Length of Room in Feet																			
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
3	15.0	17.6	20.3	23.0	25.6	28.3	31.0	33.6	36.3	39.0	41.6	44.3	47.0	49.6	52.3	55.0	57.6	60.3	63.0	65.6
4	17.6	20.4	23.2	26.0	28.7	31.5	34.3	37.1	39.8	42.6	45.4	48.2	51.0	53.7	56.5	59.3	62.1	64.8	67.6	70.4
5	20.3	23.2	26.1	29.0	31.8	34.7	37.6	40.5	43.4	46.3	49.2	52.1	55.0	57.8	60.7	63.6	66.5	69.4	72.3	75.2
6	23.0	26.0	29.0	32.0	35.0	38.0	41.0	44.0	47.0	50.0	53.0	56.0	59.0	62.0	65.0	68.0	71.0	74.0	77.0	80.0
7	25.6	28.7	31.8	35.0	38.1	41.2	44.3	47.4	50.5	53.6	56.7	59.8	63.0	66.1	69.2	72.3	75.4	78.5	81.6	84.7
8	28.3	31.5	34.7	38.0	41.2	44.4	47.6	50.8	54.1	57.3	60.5	63.7	67.0	70.2	73.4	76.6	79.8	83.1	86.3	89.5
9	31.0	34.3	37.6	41.0	44.3	47.6	51.0	54.3	57.6	61.0	64.3	67.6	71.0	74.3	77.6	81.0	84.3	87.6	91.0	94.3
10	33.6	37.1	40.5	44.0	47.4	50.8	54.3	57.7	61.2	64.6	68.1	71.5	75.0	78.4	81.8	85.3	88.7	92.2	95.6	99.1
11	36.3	39.8	43.4	47.0	50.5	54.1	57.6	61.2	64.7	68.3	71.8	75.4	79.0	82.5	86.1	89.6	93.2	96.7	100.3	103.8
12	39.0	42.6	46.3	50.0	53.6	57.3	61.0	64.6	68.3	72.0	75.6	79.3	83.0	86.6	90.3	94.0	97.6	101.3	105.0	108.6
13	41.6	45.4	49.2	53.0	56.7	60.5	64.3	68.1	71.8	75.6	79.4	83.2	87.0	90.7	94.5	98.3	102.1	105.8	109.6	113.4
14	44.3	48.2	52.1	56.0	59.8	63.7	67.6	71.5	75.4	79.3	83.2	87.1	91.0	94.8	98.7	102.6	106.5	110.4	114.3	118.2
15	47.0	51.0	55.0	59.0	63.0	67.0	71.0	75.0	79.0	83.0	87.0	91.0	95.0	99.0	103.0	107.0	111.0	115.0	119.0	123.0
16	49.6	53.7	57.8	62.0	66.1	70.2	74.3	78.4	82.5	86.6	90.7	94.8	99.0	103.1	107.2	111.3	115.4	119.5	123.6	127.7
17	52.3	56.5	60.7	65.0	69.2	73.4	77.6	81.8	86.1	90.3	94.5	98.7	103.0	107.2	111.4	115.6	119.8	124.1	128.3	132.5
18	55.0	59.3	63.6	68.0	72.3	76.6	81.0	85.3	89.6	94.0	98.3	102.6	107.0	111.3	115.6	120.0	124.3	128.6	133.0	137.3
19	57.6	62.1	66.5	71.0	75.4	79.8	84.3	88.7	93.2	97.6	102.1	106.5	111.0	115.4	119.8	124.3	128.7	133.2	137.6	142.1
20	60.3	64.8	69.4	74.0	78.5	83.1	87.6	92.2	96.7	101.3	105.8	110.4	115.0	119.5	124.1	128.6	133.2	137.7	142.3	146.8
21	63.0	67.6	72.3	77.0	81.6	86.3	91.0	95.6	100.3	105.0	109.6	114.3	119.0	123.6	128.3	133.0	137.6	142.3	147.0	151.6
22	55.6	70.4	75.2	80.0	84.7	89.5	94.3	99.1	103.8	108.6	113.4	118.2	123.0	127.7	132.5	137.3	142.1	146.8	151.6	156.4
23	68.3	73.2	78.1	83.0	87.8	92.7	97.6	102.5	107.4	112.3	117.2	122.1	127.0	131.8	136.7	141.6	146.5	151.4	156.3	161.2
24	71.0	76.0	81.0	86.0	91.0	96.0	101.0	106.0	111.0	116.0	121.0	126.0	131.0	136.0	141.0	146.0	151.0	156.0	161.0	166.0

Each quantity represents area of four walls and ceiling. Square yards at left of decimal point and fraction of a yard in square feet at right.

TABLE 18

Square Yards and Square Feet in Walls and Ceilings

11′–0″ Ceiling Height

Width of Room (Feet)	Length of Room in Feet																			
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
3	15.6	18.4	21.2	24.0	26.7	29.5	32.3	35.1	37.8	40.6	43.4	46.2	49.0	51.7	54.5	57.3	60.1	62.8	65.6	68.4
4	18.4	21.3	24.2	27.1	30.0	32.8	35.7	38.6	41.5	44.4	47.3	50.2	53.1	56.0	58.8	61.7	64.6	67.5	70.4	73.6
5	21.2	24.2	27.2	30.2	33.2	26.2	39.2	42.2	45.2	48.2	51.2	54.2	57.2	60.2	63.2	66.2	69.2	72.2	75.2	78.2
6	24.0	27.1	30.2	33.3	36.4	39.5	42.6	45.7	48.8	52.0	55.1	58.2	61.3	64.4	67.5	70.6	73.7	76.8	80.0	83.1
7	26.7	30.0	33.2	36.4	39.6	42.8	46.1	49.3	52.5	55.7	59.0	62.2	65.4	68.6	71.8	75.1	78.3	81.5	84.7	88.0
8	29.5	32.8	36.2	39.5	42.8	46.2	49.5	52.8	56.2	59.5	62.8	66.2	69.5	72.8	76.2	79.5	82.8	86.2	89.5	92.8
9	32.3	35.7	39.2	42.6	46.1	49.5	53.0	56.4	59.8	63.3	66.7	70.2	73.6	77.1	80.5	84.0	87.4	90.8	94.3	96.7
10	35.1	38.6	42.2	45.7	49.3	52.8	56.4	60.0	63.5	67.1	70.6	74.2	77.7	81.3	84.8	88.4	92.0	95.5	99.1	102.6
11	37.8	41.5	45.2	48.8	52.5	56.2	59.8	63.5	67.2	70.8	74.5	78.2	81.8	85.5	89.2	92.8	96.5	100.2	103.8	107.5
12	40.6	44.4	48.2	52.0	55.7	59.5	63.3	67.1	70.8	74.6	78.4	82.2	86.0	89.7	93.5	97.3	101.1	104.8	108.6	112.4
13	43.4	47.3	51.2	55.1	59.0	62.8	66.7	70.6	74.5	78.4	82.3	86.2	90.1	94.0	97.8	101.7	105.6	109.5	113.4	117.3
14	46.2	50.2	54.2	58.2	62.2	66.2	70.2	74.2	78.2	82.2	86.2	90.2	94.2	98.2	102.2	106.2	110.2	114.2	118.2	122.2
15	49.0	53.1	57.2	61.3	65.4	69.5	73.6	77.7	81.8	86.0	90.1	94.2	98.3	102.4	106.5	110.6	114.7	118.8	123.0	127.1
16	51.7	56.0	60.2	64.4	68.6	72.8	77.1	81.3	85.5	89.7	94.0	98.2	102.4	106.6	110.8	115.1	119.3	123.5	127.7	132.0
17	54.5	58.8	63.2	67.5	71.8	76.2	80.5	84.8	89.2	93.5	97.8	102.2	106.5	110.8	115.2	119.5	123.8	128.2	132.5	136.8
18	57.3	61.7	66.2	70.6	75.1	79.5	84.0	88.4	92.8	97.3	101.7	106.2	110.6	115.1	119.5	124.0	128.4	132.8	137.3	141.7
19	60.1	64.6	69.2	73.7	78.3	82.8	87.4	92.0	96.5	101.1	105.6	110.2	114.7	119.3	123.8	128.4	133.0	137.5	142.1	146.6
20	62.8	67.5	72.2	76.8	81.5	86.2	90.8	95.5	100.2	104.8	109.5	114.2	118.8	123.5	128.2	132.8	137.5	142.2	146.8	151.5
21	65.6	70.4	75.2	80.0	84.7	89.5	94.3	99.1	103.8	108.6	113.4	118.2	123.0	127.7	132.5	137.3	142.1	146.8	151.6	156.4
22	68.4	73.3	78.2	83.1	88.0	92.8	97.7	102.6	107.5	112.4	117.3	122.2	127.1	132.0	136.8	141.7	146.6	151.5	156.4	161.3

Each quantity represents area of four walls and ceiling. Square yards at left of decimal point and fraction of a yard in square feet at right.

TABLE 19

Square Yards and Square Feet in Walls and Ceilings

11′–6″ Ceiling Height

Width of Room (Feet)	Length of Room in Feet																			
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
3	17.0	20.0	23.0	26.0	29.0	32.0	35.0	38.0	41.0	44.0	47.0	50.0	53.0	56.0	59.0	62.0	65.0	68.0	71.0	74.0
4	20.0	23.1	26.2	29.3	32.4	35.5	38.6	41.7	44.8	48.0	51.1	54.2	57.3	60.4	63.5	66.6	69.7	72.8	76.0	79.1
5	23.0	26.2	29.4	32.6	35.8	39.1	42.3	45.5	48.7	52.0	55.2	58.4	61.6	64.8	68.1	71.3	74.5	77.7	81.0	84.2
6	26.0	29.3	32.6	36.0	39.3	42.6	46.0	49.3	52.6	56.0	59.3	62.6	66.0	69.3	72.6	76.0	79.3	82.6	86.0	89.3
7	29.0	32.4	35.8	39.3	42.7	46.2	49.6	53.1	56.5	60.0	63.4	66.8	70.3	73.7	77.2	80.6	84.4	87.5	91.0	94.4
8	32.0	35.5	39.1	42.6	46.2	49.7	53.3	56.8	60.4	64.0	67.5	71.1	74.6	78.2	81.7	85.3	88.8	92.4	96.0	99.5
9	35.0	38.6	42.3	46.0	49.0	53.3	57.0	60.6	64.3	68.0	71.6	75.3	79.0	82.6	86.3	90.0	93.6	97.3	101.0	104.6
10	38.0	41.7	45.5	49.3	53.0	56.8	60.6	64.4	68.2	72.0	75.7	79.5	83.3	87.1	90.8	94.6	98.4	102.2	106.0	109.7
11	41.0	44.8	48.7	52.6	56.5	60.4	64.3	68.2	72.1	76.0	79.8	83.7	87.6	91.5	95.4	99.3	103.2	107.1	111.0	114.8
12	44.0	48.0	52.0	56.0	60.0	64.0	68.0	72.0	76.0	80.0	84.0	88.0	92.0	96.0	100.0	104.0	108.0	112.0	116.0	120.0
13	47.0	51.1	55.2	59.3	63.4	67.5	71.6	75.7	79.8	84.0	88.1	92.2	96.3	100.4	104.5	108.6	112.7	116.8	121.0	125.1
14	50.0	54.2	58.4	62.6	66.8	71.1	75.3	79.5	83.7	88.0	92.2	96.4	100.6	104.8	109.1	113.3	117.5	121.7	126.0	130.2
15	53.0	57.3	61.6	66.0	70.3	74.6	79.0	83.3	87.6	92.0	96.3	100.6	105.0	109.3	113.6	118.0	122.3	126.6	131.0	135.3
16	56.0	60.4	64.8	69.3	73.7	78.2	82.6	87.1	91.5	96.0	100.4	104.8	109.3	113.7	118.2	122.6	127.1	131.5	136.0	140.4
17	59.0	63.5	68.1	72.6	77.2	81.7	86.3	90.8	95.4	100.0	104.5	109.1	113.6	118.2	122.7	127.3	131.8	136.4	141.0	145.5
18	62.0	66.6	71.3	76.0	80.6	85.3	90.0	94.6	99.3	104.0	108.6	113.3	118.0	122.6	127.3	132.0	136.6	141.3	146.0	150.6
19	65.0	69.7	74.5	79.3	84.1	88.8	93.6	98.4	103.2	108.0	112.7	117.5	122.3	127.1	131.8	136.6	141.4	146.2	151.0	155.7
20	68.0	72.8	77.7	82.6	87.5	92.4	97.3	102.2	107.1	112.0	116.8	121.7	126.6	131.5	136.4	141.3	146.2	151.1	156.0	160.8
21	71.0	76.0	81.0	86.0	91.0	96.0	101.0	106.0	111.0	116.0	121.0	126.0	131.0	136.0	141.0	146.0	151.0	156.0	161.0	166.0
22	74.0	79.1	84.2	89.3	94.4	99.5	104.6	109.7	114.8	120.0	125.1	130.2	135.3	140.4	145.5	150.6	155.7	160.8	166.0	171.1

Each quantity represents area of four walls and ceiling. Square yards at left of decimal point and fraction of a yard in square feet at right.

TABLE 20

Square Yards and Square Feet in Walls and Ceilings

12′–0″ Ceiling Height

Width of Room (Feet)	Length of Room in Feet																			
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
3	17.0	20.0	23.0	26.0	29.0	32.0	35.0	38.0	41.0	44.0	47.0	50.0	53.0	56.0	59.0	62.0	65.0	68.0	71.0	74.0
4	20.0	23.1	26.2	29.3	32.4	35.5	38.6	41.7	44.8	48.0	51.1	54.2	57.3	60.4	63.5	66.6	69.7	72.8	76.0	79.1
5	23.0	26.2	29.4	32.6	35.8	39.1	42.3	45.5	48.7	52.0	55.2	58.4	61.6	64.8	68.1	71.3	74.5	77.7	81.0	84.2
6	26.0	29.3	32.6	36.0	39.3	42.6	46.0	49.3	52.6	56.0	59.3	62.6	66.0	69.3	72.6	76.0	79.3	82.6	86.0	89.3
7	29.0	32.4	35.8	39.3	42.7	46.2	49.6	53.1	56.5	60.0	63.4	66.8	70.3	73.7	77.2	80.6	84.4	87.5	91.0	94.4
8	32.0	35.5	39.1	42.6	46.2	49.7	53.3	56.8	60.4	64.0	67.5	71.1	74.6	78.2	81.7	85.3	88.8	92.4	96.0	99.5
9	35.0	38.6	42.3	46.0	49.0	53.3	57.0	60.6	64.3	68.0	71.6	75.3	79.0	82.6	86.3	90.0	93.6	97.3	101.0	104.6
10	38.0	41.7	45.5	49.3	53.0	56.8	60.6	64.4	68.2	72.0	75.7	79.5	83.3	87.1	90.8	94.6	98.4	102.2	106.0	109.7
11	41.0	44.8	48.7	52.6	56.5	60.4	64.3	68.2	72.1	76.0	79.8	83.7	87.6	91.5	95.4	99.3	103.2	107.1	111.0	114.8
12	44.0	48.0	52.0	56.0	60.0	64.0	68.0	72.0	76.0	80.0	84.0	88.0	92.0	96.0	100.0	104.0	108.0	112.0	116.0	120.0
13	47.0	51.1	55.2	59.3	63.4	67.5	71.6	75.7	79.8	84.0	88.1	92.2	96.3	100.4	104.5	108.6	112.7	116.8	121.0	125.1
14	50.0	54.2	58.4	62.6	66.8	71.1	75.3	79.5	83.7	88.0	92.2	96.4	100.6	104.8	109.1	113.3	117.5	121.7	126.0	130.2
15	53.0	57.3	61.6	66.0	70.3	74.6	79.0	83.3	87.6	92.0	96.3	100.6	105.0	109.3	113.6	118.0	122.3	126.6	131.0	135.3
16	56.0	60.4	64.8	69.3	73.7	78.2	82.6	87.1	91.5	96.0	100.4	104.8	109.3	113.7	118.2	122.6	127.1	131.5	136.0	140.4
17	59.0	63.5	68.1	72.6	77.2	81.7	86.3	90.8	95.4	100.0	104.5	109.1	113.6	118.2	122.7	127.3	131.8	136.4	141.0	145.5
18	62.0	66.6	71.3	76.0	80.6	85.3	90.0	94.6	99.3	104.0	108.6	113.3	118.0	122.6	127.3	132.0	136.6	141.3	146.0	150.6
19	65.0	69.7	74.5	79.3	84.1	88.8	93.6	98.4	103.2	108.0	112.7	117.5	122.3	127.1	131.8	136.6	141.4	146.2	151.0	155.7
20	68.0	72.8	77.7	82.6	87.5	92.4	97.3	102.2	107.1	112.0	116.8	121.7	126.6	131.5	136.4	141.3	146.2	151.1	156.0	160.8
21	71.0	76.0	81.0	86.0	91.0	96.0	101.0	106.0	111.0	116.0	121.0	126.0	131.0	136.0	141.0	146.0	151.0	156.0	161.0	166.0
22	74.0	79.1	84.2	89.3	94.4	99.5	104.6	109.7	114.8	120.0	125.1	130.2	135.3	140.4	145.5	150.6	155.7	160.8	166.0	171.1

Each quantity represents area of four walls and ceiling. Square yards at left of decimal point and fraction of a yard in square feet at right.

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